THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XI. No. 262—14th YEAR.] LONDON, NOVEMBER 4, 1862. [Subscription 15s. in Advance / per Ann. 18s Credit.] DOUBLE No. Price 1s.

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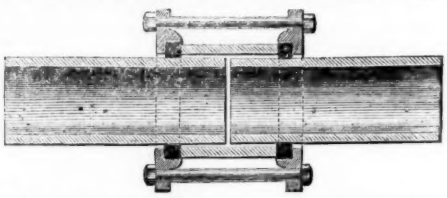

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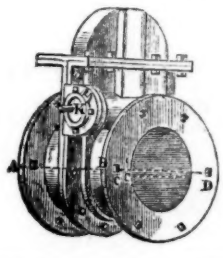

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1862,

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THOMAS GLOVER has great pleasure in informing Gas Companies and his other Patrons, that the *Jury of Class XXXI. of the International Exhibition of* 1862 have awarded, for his Patent Dry Gas-Meter, *a Prize Medal.* The reason given for this Award, in the Juries Official Report, is, *"For excellence of manufacture, as regards Dry Meters."* See Official Report, p. 346.

It is worthy of remark, that the only two other Firms who receive Awards *both manufacture imitations of Thomas Glover's* Patent Dry Gas-Meter, and the reason given for these Awards is *"construction* and sound workmanship." Thomas Glover, therefore, claims that the *construction* of his Meter has obtained *three Awards from the Jury of the International Exhibition of* 1862; at the same time, *contrasting* the Award granted for his Meter by the words, *"For excellence of manufacture, as regards Dry-Meters."*

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 4, 1862.

Notes upon Passing Events.

M. de Lapparent, "director of the French dockyards, and inspector of timber for naval purposes," has matured a plan for preventing the decay of timber, by carbonization with a jet of gas, which he is desirous of introducing to British customers. For this purpose, he has had his French pamphlet translated—a very great mistake, commonly committed by foreigners. His wiser course would have been to have placed his materials in the hands of some competent Englishman, and to have engaged him to write an entirely new essay, suited to the tone of mind of English men of business. There are speeches and proclamations which have produced a great effect on Frenchmen, Italians, and Germans, but which would be simply laughed at by Englishmen. The arguments are often as foreign as the language. Indeed, a translation of arguments from any language is a mistake. M. de Lapparent has adopted a simple and ingenious means of performing a timber-preserving operation, at least as old as the time of Homer; but his facts are better than his reasons.

The particulars he gives of the consumption of timber in France are curious. It appears that the annual produce of the French forests is only just equal to the demands for building purposes, without allowing for the quantity consumed for firewood, or for making charcoal, which is supplied by clearings of forests turned to agricultural purposes, and the cutting down of what we should call hedgerow timber. The landowners, preferring corn to timber, object—foolishly, as the author thinks—to trees; and the peasant proprietors, living under laws which make them very indifferent to the fate of their posterity, do not even replace the trees they cut down. There are about 16 million acres of forests in France, of which less than 3 are royal property, more than 8 private property, and the rest belong to communes and public institutions. The French author thinks that the State ought to be the sole proprietor of all forests. At any rate, the present Emperor was not a day too soon in reducing the duties on foreign coal and foreign timber.

The first part of this essay is devoted to arguing that timber ships cased with iron are better war vessels than those built entirely of iron. We shall not pause to discuss a question which may be still an open one in France, but has been virtually settled in England. Iron is plentiful, and comparatively cheap, in this country; and there is no doubt that the fighting navy of the future will be all iron. M. Lapparent will find few in this country, of the modern school of engineers, who would, like him, "prefer a timber-built ship of war even on condition that we find out the means of prolonging the durability of timbers," which are now, as he admits, decaying with frightful rapidity. But, dismissing as exceptional the case of cuirassed ships, there still remains an enormous wooden fleet to be provided for—in war vessels required in distant regions and for revenue purposes, and all, or a greater part, of the mercantile sailing marine—besides the illimitable demands of house-builders and civil engineers. M. Lapparent gives some very curious examples of the decay of timber which constantly occurs, in consequence of the hurry in which ships are now put together. When "timbers are not sufficiently seasoned, there is a constant discharge of aqueous vapour, which moistens the air enclosed in the channels or space and room of the ship's timbers; and, as the air is heated by the vicinity of the hold—the temperature of which often exceeds 40°—all the elements of fermentation, and consequently of decomposition, of the ligneous fibre are produced, with a maximum of force and intensity. . . . The dampness of the hull frequently deranges the calculations of the engineer, by increasing the weight, and thereby causing a deeper draught of water than had been calculated on." The author mentions, as an instance of early decay, the *Austerlitz*, a 90-gun ship, put together in rough timber at Cherbourg, in April, 1832, and launched in 1852. This ship had then been twenty years on the stocks. She had hardly been launched, when it was decided to give her steam-power, in addition to her sails; she was brought into dock, her stern removed, and replaced by another. In the beginning of 1861, the new stern, after barely six years service, was found to be quite decayed, while the rest of the well-seasoned timber was, after thirty years service, in a perfectly satisfactory state. The stern of the *Charlemagne* was in the same condition. The rapid decay of modern-built ships is traceable to the fact, that we cannot leave them sufficiently long on the stocks to be thoroughly seasoned.

In the course of an investigation into the comparative strength of various kinds of timber, M. de Lapparent found several woods from French Guyana of one-third and even double the tenacity of the best teak. "It is," he assumes, "a well-known fact that the longer wood has remained under water, the more rapidly it dries. For instance, in Paris, every

one is aware that the firewood brought out of the river is less green and burns better than that brought by waggon or boat." Yet, in the examinations before the commission on the southern embankment, some witnesses declared that the system of keeping timber floating in the Thames was very injurious to the useful qualities of the wood. Both theories cannot be correct. For M. Lapparent's ingenious explanation of his theory and diagrams, we have not space. At Tourlaville, near Cherbourg, a M. Guibert has invented a mode of seasoning timber, which appears to give more expeditious and better results than from the use of dry hot air. The drying-stove is filled with smoke, produced by the distillation of sawdust waste, tan, smiths coal, &c. By means of an ingeniously-arranged ventilator, a rotatory movement round the logs laid to season is given to the smoke, so as to obtain an average uniform temperature in every part. By this plan, there is a considerable discharge of steam from the distillation; and all cracks and splits appear to be prevented. M. Lapparent acutely observes—"The joists of the houses built by our ancestors last almost for ever, because they are in contact with the air, which is continually changing." Now, on the contrary, we foolishly enclose them between a ceiling of plaster (always very damp, to begin with) and a floor; and they rapidly decay. The timbers of our ships, placed as they are between the outside planking and the inside ceiling, are in the same predicament. The stagnant air of the channels is vitiated by the vicinity of the hold; and, at the same time, is charged with moisture, as much from the constant emission of aqueous vapour from the wood as from the leakage of water through the seams, which always open a little during rough weather. After considering various modes of preventing or discouraging what we comprehensively and perhaps incorrectly term "dry rot," the author comes to the conclusion that there is no plan so simple, effective, and inexpensive, as charring the outside of all timbers to be used in building. He observes—"By charring timber," the surface is subjected to a considerable heat, the primary effect of which is to exhaust the sap of the epidermis, and to dry up the fermenting principles; in the second place, below the outside layer, completely carbonized, a scorched surface is found—that is to say, partly distilled, and impregnated with the products of that distillation, which are creosoted and empyreumatic, the antiseptic properties of which are well known. A bench, the legs of which had originally been charred to the depth of 19 inches, after remaining in the ground eighteen years, near a pond, was dug up, and found to be in such good preservation that it was difficult to get the point of a knife into the extreme end of one of the legs. On the other hand, vine-props of oak, driven into the dry soil close by, were rotten in one year. M. Lapparent's method, which is about to be applied to all the dockyards of the French Empire, is to char, by means of a strong jet of inflammable gas. The apparatus for the purpose is simple, but could not be satisfactorily described without a diagram. The consumption of gas would be about 32 cubic feet per 10 square feet of carbonized surface. A workman, in an average day's work of ten hours, would carbonize a surface of 440 square feet, and the expense would be 1½d. per 10 square feet. A little tar—not too much—smeared over the surface, facilitates the process; prevents the timber from being too suddenly affected by the heat of the gas, and facilitates the carbonization of cracks. "But more than a mere thin coat of tar would do harm." In ship-building, gas-charring should be applied to every surface likely to be in contact with moist or stagnant air. In house-building, it should be applied to the beams and joists embedded in the walls or surrounded with plaster; to the joists of stables, cow-houses, and laundries, which are affected by warm, moist atmosphere; and to the wainscoating of ground-floors. For railway-sleepers, charred timber, when scraped, can be painted any colour. We get an idea of the importance of the wine trade in France, from the incidental observation that "the renewal of the vine-props alone costs five millions sterling annually." The value of these statements may be left to the parties interested in the use of timber. Of course, there can be no patent for charring wood with gas or any other flame; and, as for apparatus, any real mechanic will invent, on demand, half-a-dozen modes of carrying out M. Lapparent's valuable suggestion.

The annual report of the Metropolitan Board of Works contains more matter of interest than on any previous occasion. Of course, the main drainage occupies the first place and the greatest space. It is very difficult to keep interest alive in an unfinished undertaking, however great, when its progress is almost entirely out of sight. It is well to repeat that "the works are designed for taking off the ordinary rainfall of about 117 square miles, and the sewage and refuse of a prospective population of 3½ million persons." Still people, true representatives of those who grew tired of hearing Aristides, called the Just, are apt to wish that they could hear no more of the main drainage until it is completed. One of the highest compliments that can be paid to the managers of this gigantic bore is that we hear so little about it—all goes on smoothly and steadily as the operations of a live mole. It is only when we are stopped by shaft-holes in a line of streets where the middle-level tunnellers are at work, that we find out where the sewer-rates we pay so regularly are as regularly and, no doubt, judiciously spent. The high-level sewer has been completed within the estimates. The middle level has been, if we may judge by the expenditure, more than half executed. The low level waits for the Thames Embankment, which it is to enter at Whitehall, leave at Blackfriars Bridge, and probably follow for some distance the line of the projected street which is to unite Blackfriars with the Mansion House; but is to be settled by a commission some time next year. Amongst the minor branches of the northern drainage, of no small interest to the frequenters of Hyde Park, is the one called the Ranelagh Overflow Sewer, which has this summer been finally completed. It commences in the Uxbridge Road; and, passing through Kensington Gardens and Hyde Park, terminates at Knightsbridge, after entirely diverting from the Serpentine the sewage which previously turned that ornamental lake into an odoriferous pool every hot summer. We only wait now for that well in Kensington Gardens, from which Messrs. Easton and Amos promised such a perpetual supply to have the Long Water and the Serpentine restored to Arcadian pellucidity. As we shall every year have a report on the works in progress on the north side until they are completed, it is not worth while to say more about them. On the south side, the largest work is half finished, and the rest are being pushed on steadily. In carrying out the main sewer between Putney and Deptford, "large bodies of water were met with. In one place, it became necessary to pump to the extent of 8000 gallons per minute, being about double the supply of the Kent Water-Works!"

It is satisfactory to find that one capital improvement—the new communication from Southwark to Westminster—is so nearly finished. All the property required has been purchased. Encouraged by that little experiment in the Covent Garden approach, the Board has determined on constructing a subway for gas and water-pipes along the whole length of this new Southwark Street—upwards of 1200 yards; nearly half of this distance has already been executed.

With respect to the Thames Embankment, Mr. Bazalgette has made three several efforts to distinguish himself by variations on the plans of the Thames Embankment Commissioners. In his report on the Northern Embankment, he suggests that, in order to relieve the traffic from the west to the City, now passing down the Strand, a direct road should be cut through the gardens of Northumberland House on to the Embankment Road; but, that if this should be found too costly, the block of houses between Northumberland and Craven Street should be purchased to make room for a curved line from the east corner of Northumberland House to the new railway. "This would be 400 feet nearer than by Whitehall Place, and 100 feet nearer than along the Strand and down Norfolk Street—although the removal of the town mansion of the Percys is merely a matter of time, and probably a very short time—but it is too great an undertaking for the Metropolitan Board, and must be left to a railway company, we fear. The next suggestion was, that a Bill should be introduced into Parliament authorizing the extension of the embankment to the second arch of Waterloo Bridge, so as to cut off the curve that now exists, and will still exist, under the commissioners plans, between Waterloo and Hungerford. But the Metropolitan Board were not at all inclined to enter into a parliamentary contest in order to carry out "*an opinion*" of their engineer, and this improvement fell to the ground stillborn in the Spring Gardens Parliament House. The third suggestion—more important than the other two—must also form the subject of an Act of Parliament, if it is to be carried out. The Board of Works engineer objects to leaving the boundary of the south side between Blackfriars and Westminster to the good will and pleasure of the wharf owners, and the cobbling works of their builders. He pro-

poses to go boldly to work, reclaim the land in front of each wharf, present it to the owner, whether he requires it or not, and charge the reclaimed land with the cost of the embankment. There can be no doubt but that this is the best plan if Parliament will risk the land speculation—for a land speculation it is. What is to be done with wharf owners who have no ready money, and whose wharves are already fully mortgaged? But that is a minor objection. Altogether, there seem fair hopes that the embankment of the Thames will afford the Metropolitan Board full occupation for some years after the main drainage has been completed.

Queensland is one of the last established of the English colonies. Three or four years ago, it was a squatting district of New South Wales; but the northern and southern interests would not agree on the important question of taxes. The northerners, who, in this instance, represent the country nearest the tropics, appealed to the mother country; and, by good management, obtained a Colonial Office decree of separation. New South Wales was much annoyed at losing a district and community so well able to pay taxes; but, nevertheless, not being a United States, submitted; and now, Queensland, with the population of a third-rate county town, has seceded; and obtained a governor—a K.C.B., sent from England—a Parliament, a responsible ministry, with a premier, two parties—the ins and outs—and, of course, contested elections. We have before us a file of Queensland newspapers, which are larger, and quite as well printed as the best provincial newspapers of France. One glance at them is sufficient to show that, if the population is small, the commercial activity is great. Advertisements, of the most varied character, fill two-thirds of each paper, and tell more plainly than the leading articles the story of the lives of the colonists. For instance, in a number of the *Darling Downs Gazette*, a candidate for a seat in the Queensland House of Commons advertises his address to the free and independent electors of "Drayton and Towoomba" in German as well as English; thus showing that the German population has a considerable stake in the new colony; and so the result proved; for, a little later, we find the candidate—who had, in his capacity as magistrate, fined a German for breaking his contract of service—defeated, after a hot contest in which some four hundred voted, by the votes of the German settlers. In other advertisements, German names are prominent; for instance, Martin Klein takes advantage of a colonial impounding Act, which apparently establishes a statute of limitation as to strayed beasts; for Martin Klein says: "I have this day taken out of the Drayton Pound, a white steer, branded K, on the near shoulder. Any one showing a better claim to him than myself, can have the same, within one month, by paying expenses." Horse-stealing is, of course, a favourite crime in a country where every one rides; and some of the freebooters seem to be quite in the Paul Clifford style. For instance, the following is the description of the appropriator of a heavy brown mare:—"Black moustache and whiskers, genteel looking, about 5 feet 9 inches high, a middle-sized man; a dark Californian hat, red Crimean shirt, light gaiters, and top boots." The last words are certainly puzzling: did he put the gaiters over the top boots, or the boots over the gaiters? A whole column is filled with advertisements of lost or stolen horses. An official advertisement contains the particulars of a financial operation new to the old country. To provide funds for making a tramway between Ipswich and Dalby, scrip, in sums of £20, bearing interest at £5 per cent., and transferrable on delivery, is offered for sale by the colonial treasurer—this new kind of paper money deriving its value from a condition that it shall be received in payment of any Crown lands purchased by the holder. It is a curious operation; and, if strictly limited within the demand for land, may prove an easy and cheap mode of raising money for public reproductive works. Towoomba has its railway party as against the tramway party, though nothing could be more absurd than a railway in such a country. We get a notion of the climate from the advertisement of a nurseryman at the capital, Brisbane, who offers a collection of tropical fruit-trees—custard-apple, cherimoys, pumplenose, guava, lime, loquat citron, granadilla, coffee, date-palm, banana, &c., besides orange, peach, nectarine, apricot, and almond. These must be intended for cultivation in the open air, as glass is unknown in Queensland, and a gardener receives wages equal to the salary of a first-class cashier in England. But, in some parts of the colony, frosts seem severe; for a correspondent of the newspaper quoted, dating from Warwick, says: "I took a piece of ice, half an inch thick, off a tub this morning." Query, would such a climate suit cotton? These files do not give the slightest encouragement to the cotton-cultivating schemes, on which certain schemers fluently discourse in England. There is evidently no spare labour to be had. The scheme on foot for importing coolies has not yet been carried out, and is vehemently opposed by the labouring classes, who have votes, and, apparently, by many above the rank of labourers. Committees have been formed for contributing to relieve the distress in Lancashire, by assisting the operatives to emigrate to Queensland; and, probably, in no way could the comparatively small sums that can be raised in Australia be better applied than in conveying willing labourers, from famine and enforced idleness, to a land where labour can most easily create wealth. The German emigrants appear to thrive wonderfully; Lancashire emigrants would do at least as well. There can be no mistake in sending out the young and able-bodied of both sexes—or, still better, complete families: good wages and kind treatment await such. But those respectable people with small capital, who go out to a colonial life of which they know little, to grow cotton, of which they now nothing, will be bitterly disappointed.

Circular to Gas Companies.

We insert, in another column, an interesting article, translated from our Parisian *confrère*, on the manufacture of alcohol from coal-gas—a scheme which has been put forward by M. Cotelle, a young French chemist, and which was lately announced in sensation paragraphs in the London papers as a great discovery. According to the inventor's account, a hectolitre, or 22 gallons, of strong alcohol, of good flavour, can be produced from coal-gas for 25 francs; and French and English speculators are said to have been so captivated with the notion of obtaining brandy at 1s. a gallon, that large sums have been offered to the inventor for his patents. The description of the process, however, even as given by the inventor himself, is sufficient to destroy expectation of realizing the results he promises. It is well known that alcohol consists chemically of nearly equal parts of aqueous vapour and olefiant gas; and, in some recent experiments by M. Berthollet, he succeeded, after long agitation of strong sulphuric acid in olefiant gas, in causing the acid to absorb a portion of the gas, and, by afterwards diluting it with water and distilling it, he obtained a small quantity of alcohol, which was shown as a great curiosity in the French department of the International Exhibition. On that experiment the invention of M. Cotelle seems to be based; but, instead of employing pure olefiant gas, he uses common coal-gas, which contains only a very small proportion, if any, of olefiant gas. By M. Cotelle's own showing, it requires about 30 cwt. of strong sulphuric acid to produce one hectolitre, or 22 gallons, of alcohol; and that alone presents a formidable obstacle to the manufacture of cheap brandy from gas, without taking into consideration the cost of the gas, or the time and labour consumed in the manufacture. It may be remembered by some of our readers, that a much more feasible plan for obtaining cheap spirits was proposed about thirty years ago, by collecting the alcohol from the vapour emitted in baking bread. The plan was, in fact, put in operation, and rival bakers had the opposite announcements in their shop-windows of "Bread without gin," and "Bread with the gin in it," to attract different classes of customers. As the ovens constructed for the collection of the alcoholic vapour somewhat resembled stills, the excise officers interfered, and prevented the value of the scheme from being practically tested. It promised, however, to be much more successful than the new project for making brandy from coal-gas; and there was no question about the spirit obtained being free from empyreumatic flavour, which it is suspected must vitiate the taste of the gas-brandy.

We have hitherto refrained from noticing the defective light of those lamps in the City to which the carburetting process is applied, as we desired not to increase the difficulty of the experiment which we wished to see fairly tried; but the complaints have become so general, that they cannot be longer disregarded, and they have found vent in the City Court of Sewers. Even Dr. Abraham, the chief supporter of the process, is now compelled to admit that the experiment has failed, though he attempts to throw the blame on the gas company, for not having supplied the quantity of gas to each lamp that

was contracted for. Had there been any foundation for such a charge, the engineer—who has been, for some time past, endeavouring to ascertain experimentally the quantity of gas consumed by the street-lamps, by fixing meters to several, in different parts of the City—would have made some report on the deficiency; but, so far from doing so, he has admitted the claim of the Great Central Company to be paid a large sum for gas consumed above that required by their contract, on account of the Carburating Company not having been in a position to apply their process to all the lamps to which the diminished quantity of 3 feet per hour was to be supplied. It is quite clear that, had there been any pretext for charging the company with deficiency of supply, the claim for having supplied an extra quantity would have been disputed; but there was no question whatever raised respecting the quantity—it was only to the price charged for it per 1000 feet that the engineer objected. The gas company considered that they were entitled to charge for the extra quantity at the rate of 4s. 6d. per 1000 feet, the same as to private consumers, as it was not included in their contract for public lighting; but, after a conference, they consented to commute the charge so as to reduce the price per 1000 to about 4s. 3d. Dr. Abraham, while admitting that there was general discontent with the result of the carburetting process in the City, at the same time insinuated that the complaints made against it had proceeded from the Great Central Company, who were, he said, "at the bottom of them all." As the learned doctor has announced that he is not to be "bamboozled" with reasons, like ordinary men, he will not, probably, admit that he has placed himself on the horns of a dilemma. Either there is truth in the complaints against the dim light given by the carburetted gas, or there is not. If the complaints be well founded, then the Great Central Company cannot fairly be accused of promulgating false reports; and, if the complaints be not true, and the carburetted lights have good illuminating power, then the charge against the gas company of deficiency of supply falls to the ground. Let any one, however, walk in the City after the shops are closed, and he will perceive, by the general gloom of the streets in which the carburetting process is adopted, that the reported darkness is a fact; and, on the other hand, the admission by the City engineer, that a large extra quantity of gas has been supplied by the Great Central Company in the carburetted district, sufficiently exonerates them from the charge of being accessory to the darkness.

The public light question will give rise to never-ending disputes, until the local authorities determine to consume gas by meters, one being attached to each lamp; or until the advent of the Millennium foreseen by Mr. Rutter, but by few besides, when the sellers and buyers of gas shall sit down pleasantly together, and, forgetting their opposing interests, shall devote themselves calmly to the pursuit of philosophical examinations respecting the average quantities of gas consumed by any given burners. In the mean time, this vexed and most vexatious question occasions continually-recurring ill-feeling and costly litigation, in which professional agitators often reap a rich harvest, without any advantage to the parties most concerned. After a great expenditure of public money, satisfaction is seldom obtained; and frequently the local authorities, who fancy themselves aggrieved, have to submit to harder conditions than those to which they were before subjected. The Birmingham town council were recently dissatisfied with the low price of 2s. 11d. per 1000 feet, at which gas is supplied in that town to the public lamps, and they named Mr. Samuel Hughes as arbitrator on their behalf, under the provisions of a local Act, to obtain still lower terms; but, as yet, nothing has been heard of the proceedings. The time within which the arbitrators should have made their award expired on the 23rd ult., but no award has been declared, and we believe no umpire has been appointed. Such references have generally resulted in an increase in the price; and the Birmingham authorities may, on reflection, have thought it more prudent to let the matter drop, as they could not reasonably expect to improve their position by arbitration. The corporation of York experienced, in 1859, the damaging effect of such a proceeding. They were dissatisfied with the price then paid; they had recourse to arbitration, and they have for three years had to pay 4s. 9d. per 1000 feet for the gas consumed in the public lamps. That contract ended in June last, and the Public Lighting Committee endeavoured to procure a reduction in the price. The gas company at first objected; but they afterwards proposed to renew the contract for three years, at the rate of 4s. 3d. per 1000 feet, including lamp-posts, lamps, lighting, &c., being a reduction of 6d. per 1000 feet. A committee had, however, been appointed to consider the desirability of providing gas for the public lighting, and to obtain estimates of the cost of works for the purpose. The committee made their report at the last meeting of the city council, from which it appears that they had applied to Mr. G. W. Stevenson, of Halifax, to make the required estimates, which included the cost of gas-works for the lighting of the city generally, as well as for the public lighting; but, as the views of the council were confined to the accomplishment of the latter object, we need not notice the general estimate further than to mention that Mr. Stevenson estimated the cost of works capable of producing, storing, and delivering 500,000 cubic feet of gas per day, at £33,783, for which sum he stated that he was prepared to find respectable and responsible contractors to complete the works. The construction of works, and the provision of distributing apparatus for the public lighting of the city only, he estimates at £10,432, for a yearly consumption of 7,300,000 cubic feet of gas, distributed through about 22 miles of pipes. The annual cost of the works and of the gas is estimated at £1325, consisting of the following items:—

Interest at 4 per cent. on £10,432 .	£417	0	0
646 lamps, lighting, extinguishing, cleaning, and repairing, at 8s. 6d. .	274	11	0
Cost of 7,300,000 cubic feet of gas at 14·68d. per 1000 feet	446	10	0
The sum, which laid aside annually at 4 per cent. compound interest will, in 30 years, produce £10,432 to repay the cost of the works . .	187	5	0
	£1325	6	0

As the annual charge of the gas for the public lamps by the company, after the reduction to 4s. 3d., would be £1538, Mr. Stevenson draws the conclusion that the charge is largely in excess of the average price in other cities and towns where the cost of producing gas is about the same as in York. The Lighting Committee refer in their report to the large profits derived from the supply of gas by the corporations of Halifax, Manchester, and Carlisle; but, though they observe that similar profits would "of necessity" arise in York, if the corporation supplied private consumers as well as the public lamps with gas, they nevertheless limit their recommendation to erect gas-works for the supply of the public lights, being no doubt aware that the large profits of those corporations were chiefly owing to the high prices at which the gas was charged to private consumers. The committee suggest that, after the experiment of supplying gas to the public lamps has been successfully tried, the corporation would then be in a position to extend their gas-lighting operations to the City generally; for which purpose it is said no Act of Parliament would be required, as the adequate power was conferred on them by the City Commissioners Act. It appears, however, from the concluding paragraph of the report, that the recommendation to erect gas-works is only conditional on the refusal of the gas company to make "a considerable further reduction in their charge for gas," which, considering their financial position, it is said they can well afford to do. The recommendation thus resolves itself into a threat, which we conceive the corporation are too wise to carry into execution, even should the gas company not yield to intimidation.

The proposal to erect works for the supply of the public lamps with gas is quite a legitimate one for the corporation to entertain; but, it behoves local authorities, before they adopt such an extreme course, to feel assured that they are proceeding on secure ground. Notwithstanding Mr. Stevenson's reputation as a gas engineer, we venture to doubt whether his calculations of the first cost and of the expenses of carrying on the works can be realized. He has omitted some necessary items in their construction, and he appears not to have taken into consideration the difficulty of borrowing money on the security of the bricks and mortar of a gas-work. In the first place, neither Mr. Stevenson nor any other engineer tenders his professional services gratuitously, but no account is taken in the estimate of such remuneration. With respect to the difficulty of obtaining money, we have occasion to know that recently a body of commissioners, who possess unlimited powers of rating the owners and occupiers of property to make up any deficiency, had some difficulty in raising £15,000 at even 4½ per cent. interest on the security of a gas-work that realized a profit of £1000 per

annum. The corporation of York could not offer equally good security on their proposed gas-works, and they could not, therefore, expect to borrow money on the security of the works alone at 4½ per cent. In estimating the cost of production and distribution, Mr. Stevenson appears to have fallen into still more serious errors. The whole fabric of his estimates rests on the assumption that gas of good illuminating quality can be manufactured in York for less than 1s. 3d. per 1000 feet. The details of the estimated expenditure are not given, nor is it stated whether the cost of the gas is estimated at the works or at the burner, but we presume the latter is intended, otherwise the loss from leakage would have to be added. We feel confident that 2s. per 1000 feet would be nearer the actual cost of the gas; and, when the higher rate of interest on a larger capital is taken into account, the balance would be largely against the public were the project recommended by the Lighting Committee carried into effect.

The concluding paragraph of Mr. Stevenson's report exhibits an *animus* against gas companies which we should not have expected to be expressed in such terms by an experienced, sober-minded engineer. When he speaks of old gas companies as being "burdened with an accumulation of mis-spent capital," of the advantage of starting "free from this incubus," and of "destroying a monopoly which appears to be a serious evil," one could imagine that the expressions were dictated by a Flintoff or a Hughes.

An extract, inserted in another column, from the annual financial report of the Metropolitan Board of Works, relating to the carrying into operation of the Sales of Gas Act, and a similar report at a meeting of the justices of the peace for the City of London, inserted in our last, strongly confirm, by the contrast of the two accounts, our assertion that the Board committed a great blunder in their mode of proceeding. Had they adopted our suggestion, of testing meters on the premises of the makers, it would have been a great convenience to the trade, and would have secured to the inspectors of the Metropolitan Board a much larger share of the fees; for nearly all the meter factories in the metropolis are within the jurisdiction of the Board. As the matter stands, however, out of 85,451 meters stamped in London in the year ending at Michaelmas last, the four inspectors of the Metropolitan Board stamped only 23,848, whilst the one inspector in the City stamped 61,603. We will not now inquire why preference is given by the manufacturers to the City inspector; but there can be no doubt that, had they been offered the accommodation of having meters inspected on their premises, the proportionate quantities stamped by the officers of the Board and by the City inspector would have been greatly altered.

We continue to report the proceedings of the Metropolitan Board respecting the applications for licences to store petroleum. The more the subject is considered, the greater appears to be the danger of allowing such an inflammable material to be stored in large quantities in the neighbourhood of other combustible property. A long discussion took place at the meeting of the Board on the 24th ult. on the propriety of giving notice to the neighbours of those who apply for licences that such applications have been made, to afford them full opportunity of reporting to the Board their objections to licences being granted. All the speakers were agreed that such notice should be given, but they differed regarding its form, and the matter was again referred to the Streets Committee. At the subsequent meeting of the Board, the committee brought up their report, which was agreed to, recommending "that, fourteen days previously to the consideration by the Board of any application for a licence under the Petroleum Act, notice of such application be affixed by the officers of the Board to the premises in respect of which the licence shall be applied for, with the consent of the applicant, who is to be responsible for the notice remaining where placed, and a copy thereof also forwarded to the vestry or district board within whose jurisdiction the premises shall be situated." With the exception of the application of Sir Charles Price and Co. for a licence to store "Rangoon earth oil," noticed in our last "Circular," all the applications hitherto made have been refused. As an appropriate caution at this time against permitting such a dangerously inflammable fluid to be stored in towns, there has been an extensive conflagration at the oil-wells, which burned without control over a space of 20 acres until nothing was left that could be further destroyed.

A successful experiment of making gas from petroleum in the country where it is produced is recorded in the *Toronto Globe*, of the 4th ult., in the following letter from the proprietor of an hotel at St. Catherine's, Canada:—

Stevenson House, St. Catherine's, C.W., Sept. 26, 1862.

I have much pleasure in giving public testimony to the excellence, cheapness, and freedom from all kinds of annoyance from smoke or smell of the petroleum gas made at my establishment, in the patented works erected by Mr. James E. Thomson. The works have now been in operation for six weeks, and have given uniform satisfaction in every respect. They supply my establishment, the Stevenson House, St. Catharines, C.W., with 180 burners, at a cost of 86 cents a night.

I most cordially recommend Thomson's petroleum gas to the general public.

(Signed) E. W. Stevenson.

To James E. Thomson, Toronto and Buffalo.

The *Journal of the Board of Arts and Manufactures for Upper Canada* considers the introduction of petroleum gas at so low a price an important event in the history of gas lighting in Canada, where common gas is now sold at 10s. the 1000 feet; and remarks on the foregoing letter:—

This is a most satisfactory testimonial respecting the extraordinary cheapness, purity, and excellence of petroleum gas. The importance of the new process for gas illumination will soon be appreciated, when such establishments as the Stevenson House find it economical and agreeable. It seems almost incredible that 180 burners can be fed for the trifling sum of 86 cents a night. Under the old system of burning coal-gas, 180 burners lighted on an average 4 hours per diem, and burning 3 feet an hour, would consume 2160 feet of gas, which, at $2 50 per 1000, would cost $5 40 per night. The difference in favour of petroleum gas, according to Mr. Stevenson's statement, is 4 dollars 54 cents, or upwards of $1600 dollars a year. Where 4-feet burners were formerly used with coal-gas, instead of the 1-foot burner with petroleum gas, and assuming that the average time of the gas being lighted at 5 hours a day, the saving is proportionately greater. When the works at the Rossin House are completed, which will be at the close of this month, the citizens of Toronto will have an opportunity of daily witnessing this beautiful light, and satisfying themselves by personal inspection of its extraordinary cheapness, brilliancy, and purity.

We are informed that arrangements are in progress for making an experiment, on a practical scale, at a provincial gas-work in this country, to test the economical applicability of petroleum for gas making. We are promised to be favoured with the results of the experiment, which will be of great interest.

We reprint, from the *Chemical News*, a report by Mr. J. H. Pepper on the process recently patented by Mr. James Webster, of Birmingham, for the production of oxygen gas. The materials used are the nitrate of soda of commerce and dry oxide of zinc, and the gas produced is a mixture of oxygen and nitrogen, in the proportion of 58 per cent. of the former to 42 per cent of the latter. Atmospheric air contains about 21 per cent. of oxygen, and 79 per cent. of nitrogen; so that Mr. Webster's gas is 37 per cent. richer in oxygen than the air we breathe, but still is too largely diluted with nitrogen to be of much value. Mr. Pepper's experiments go to show that a burner supplied with 5·3 cubic feet of the mixed gas per hour and 4·2 cubic feet of coal-gas, will give the same light as 15·5 cubic feet of the latter when burned by itself, and that, *if the value he assigns to the residual products can be realized*, the oxygen-supplied light will cost ·88 of a penny per hour against ·83 of a penny with coal-gas at 4s. 6d. per 1000 feet. The economy is, therefore, nearly 6 per cent. in favour of coal-gas, under the most favourable circumstances, for the new process; but, should the residual products turn out to be valueless, the cost of the oxygen-supplied light would be 2·06d., per hour, or 148 per cent. in excess of the cost of coal-gas. In these calculations, nothing is allowed for fuel, labour, and wear and tear of apparatus in the production of the oxygen, or interest of capital, all of which are included in the cost of the coal-gas at 4s. 6d. per 1000 feet. To make the comparison perfect, the latter should have been estimated at the cost per 1000 feet for materials only.

A very elaborate and useful series of tables for facilitating calculations of the results of photometrical experiments, has been constructed and published by Mr. Wm. Sugg. The first, or general table, is calculated to show the value, in standard candles, which a given quantity of gas bears to 1 candle, burning from 110 to 135 grains per hour. The rest of the tables are founded upon this one, and are arranged very conveniently. They are twelve in number, and are divided into twenty-seven columns each, the first of which contains the number of cubic feet of gas consumed per hour, increasing in tenths of a cubic foot, from 4·5 to 5·5. The heading to each of the other columns indicates the number of grains per hour consumed by the sperm candle from 110 to 135 grains; and, underneath in each of these columns, and opposite to the quantity of gas recorded by the experimental meter, will be found the value, in standard candles, of the gas burned at the rate of 5 cubic feet per hour—all further calculation being thereby rendered unnecessary. The tables are mounted on cloth, with roller, &c., and form a very necessary appendage in the photometrical-room.

Register of New Patents.

67.—Richard Archibald Brooman, of 166, Fleet Street, London, patent agent, for "*Improvements in apparatus for carburetting and burning gas.*" (A communication.) Patent dated Jan. 9, 1862.

This invention consists in enriching lighting gas with carbon in manner hereafter described, whereby the brilliancy of the light is increased. A vessel containing naphtha or other liquid capable of carburetting gas, is placed inside or outside a lamp, according to the nature of its construction, or to the position it has to occupy. The spindle of a gas-burner passes through the carburetting vessel, the upper part of which is tubular, and space is left all round between the spindle and the tube. Surrounding the spindle in the vessel is a wick made of felt, cotton, amianth, or other suitable material, the lower portion of which enters the carburetting liquid. A tube leads from the gas-pipe or spindle outside of and below the vessel to the upper part thereof, whereby gas is led into the vessel, which, pressing on the liquid contained therein, drives the liquid up the wick, and the gas following they become mixed, and are consumed together at the burner. The wick is prevented from contact with the flame by an oval or circular plug pierced with holes, or with a saw-cut. A portion of the gas to be consumed flows up the spindle to the burner in the ordinary manner. During the passage of that portion of the gas which is led into the carburetting vessel along the wick, it becomes charged with liquid and is consumed when it reaches the burner, together with the gas which has not been passed through the carburetting vessel. A current of air flowing between the gas-supply tube and the carburator assists combustion; the current may be made double as in ordinary lamps, or it may be a simple current according to the carburetting liquid. By the mingling of the two flames, one proceeding from an ordinary burner, and the other from the carburator, the middle of the gas-flame which is usually black (owing to the quantity of carbon deprived of contact with the air) becomes brilliant, and the intensity of the flame is thereby materially increased. The reservoir, or carburator properly so called, may be made of any suitable material such as metal, glazed or enamelled or not, porcelain, enamelled ware, or other analogous compositions. This invention may be advantageously applied to gas-burners used in houses and apartments. The carburator may also be arranged in such manner as to have fitting to it one or several reflectors. In the case of several globes, it is as well to place a reflector to each, or a reflector common to all.

The claims are—

1. The employment in apparatus for carburetting and burning gas with a wick and burner, the said wick being protected and capable of absorbing and raising the carburetting liquid, as hereinbefore described.

2. The employment of a current of air between the carburator and the tube leading to the burner, as hereinbefore described.

3. The employment of two currents of gas, one of which is carburetted as hereinbefore described, while the other is ordinary coal-gas, and passes direct to the burner, where both currents are consumed together, as hereinbefore described.

113.—William Cleland, of St. George's Hill, Everton, Liverpool, for "*Improvements in treating and utilizing certain materials used, and products obtained in the manufacture of gas, and in apparatus connected with the said treatment.*" Patent dated Jan. 15, 1862.

1. These improvements relate to the extraction of ammonia and sulphur from bog iron ore and other oxides of iron that have been used for purifying gas from these substances. This is effected by distillation or sublimation, and in general it is found most convenient to employ retorts somewhat similar to those used in the distillation of coal or cannel, or such as have been set or used for gas-making from coal or cannel, introducing divisional plates or diaphragms, say, between the retorts and their mouthpieces, and making suitable openings in the said mouthpieces and the doors for connexion of pipes or other apparatus to carry off the volatile and other distilled products. When a charge of the "spent oxide," has been placed in the retort, the lid, door, or cover luted on, and heat applied, ammoniacal vapours, more or less contaminated with sulphur, are given off, if the material contains ammonia, and this at a low temperature, before the mass of the charge has been sufficiently heated for free distillation of the sulphur. The said vapours may be condensed in suitable apparatus with or without water or acids. As the heat increases the sulphur vapour comes over, still accompanied by ammoniacal vapour if ammonia is present, and is condensed in the mouthpiece in any cool part of the retort, or in suitable cooling apparatus, from which it flows in a liquid state into any suitable receptacle; and, on solidifying, forms "rough sulphur." The ammoniacal and watery vapours, requiring a lower temperature for their condensation, pass to that part of the apparatus intended for their reception. A heat below visible redness is sufficient for the distillation of the sulphur, but a dull-red heat is in general the most advantageous, although higher heats may be used if the power of condensation is sufficient to prevent the escape of gaseous free sulphur. The condensed ammonia and ammoniacal salts may be separated from sulphur by lixiviation and purified by redistillation from lime, the distillate being received into sulphuric acid in the usual way. As the distillation of the sulphur proceeds, it is found advantageous to agitate the material in the retort by a suitable tool, using preferably for horizontal retorts a tool so constructed that it will turn over the material in the manner of a plough, the handle or shaft being worked through a small orifice in the door, lid, or cover of the retort, to avoid the admission of air. By so stirring or agitating, and thus bringing a larger proportion of the charge in contact with the interior surface of the retort, the process is shortened and fuel saved. Fuel is also saved by using the waste heat from gas retorts or any other waste heat where such an arrangement is convenient. In using the waste heat from gas retorts, for instance, the sulphur retort oven or ovens are placed at the back of or contiguous to, or in the vicinity of the ovens in which the gas retorts are set, and the whole or part of the waste heat is carried beneath or around the sulphur retorts, the quantity being regulated by dampers, and finally allowed to pass into the chimney. By the use of cooling apparatus, similar in its principle of action to that ordinarily used in the manufacture of "flowers of sulphur," the sulphur may be obtained from "spent oxides," in the form of "flowers," or the purer portions may be formed into "roll" or "stick sulphur," by allowing them to flow into suitable moulds, the ammonia, if any, having been previously extracted by the mode or modes hereinafter described.

It has been stated that sulphur can be extracted from "spent oxides" of iron by distillation or sublimation, but this has been done under the erroneous impression that the process is applicable to all such oxides. The process of distillation or sublimation is subject to serious limitations and exceptions, and the unqualified assertion, that "spent oxides of iron," will thus yield free sulphur, is fallacious. When these oxides are heated in closed vessels, there is produced a chemical compound of sulphur and iron, which is called "sulphide of iron," (a term used without its scientific accuracy being vouched for) and not, as heretofore imagined, a mere mechanical mixture of oxide of iron, or carbide of iron, with carbonaceous matter and sulphur. Unless, therefore, a "spent oxide," contains more sulphur than is necessary for the production of this so-called "sulphide of iron," it yields no free sulphur at any degree of heat that is practically applicable. Now, there are many "spent oxides," containing a large per centage of free sulphur, which yet contain no more than is necessary to the production of the "sulphides," and the process as applied to them is a failure. For instance, hard oxides that are not very finely divided, and oxides prepared from iron-borings exposed to air and moisture. It is only from oxides, therefore, comparatively rich in sulphur, that it is extracted by distillation or sublimation. A simple method of ascertaining whether a "spent oxide" may be advantageously treated for sulphur under this head, is to heat a known weight, say half a pound, in a small porcelain retort and weigh the sulphur, if any, that comes over.

Clay retorts, on account of their porosity and liability to crack, are not in general to be recommended for this processs unless low heats are used. Cast-iron retorts are preferable for the higher heats, and wrought-iron or a combination of wrought and cast-iron gas-retorts may be profitably applied to this purpose in the summer months when they are not required for gas making. A moderate coating of carbon internally is no objection, but rather an advantage, particularly if wrought iron is employed, as it protects the iron from the action of the sulphur, and the retorts may be restored to their original use with little alteration.

When apparatus is specially constructed for the treatment of "spent oxides of iron," a vertical or inclined retort is preferred, capable of being charged at top and drawn at bottom, and in which the evolution of both sulphur and ammonia may go on simultaneously and continuously.

The following mode of fixing the ammonia is preferred:—The vapours are led into the condensing vessels by pipes, such vessels being provided with tiers of grids or perforated plates as in dry-lime purifiers, charged with the crude sulphate of iron material (obtained as described under the sixth head, hereinafter mentioned), which it is best to have in rather fine powder, and somewhat damp. As the uncondensed gases pass through this material, the ammonia is more or less perfectly arrested and fixed, and the sulphate of iron decomposed. When it is found, on agitating a sample of the material with water, and adding caustic ammonia to the clear solution, or by any other test, that it no longer contains soluble salts of iron, the material may be discharged and a fresh supply substituted. On lixiviating the spent material with water, and evaporating the solution, crystalline sulphate and sulphite of ammonia are obtained. When the crude sulphate of iron is first used for this purpose, it is preferred to mix it with sawdust or other porous material to increase its porosity. After the first charge is spent, however, mixture with foreign matter is no longer necessary, as the fresh sulphate of iron may be mixed with a portion of the spent material, which answers the same end as the sawdust.

Another mode of fixing the ammonia consists in placing sawdust, moistened with water, on one or more of the lower grids or perforated plates, and on the upper ones sulphate of iron or sawdust, moistened with weak sulphuric acid. The more fixed ammoniacal compounds, such as sulphate and sulphite, will be arrested by the moist sawdust, while the ammonia of the more volatile products, such as the hydrosulphate of ammonia, will be fixed by the sulphate of iron or sulphuric acid. The sulphate of ammonia obtained by either of these modes, and contained in the spent sulphate of iron material, may be extracted by lixiviation. In effecting this, a given quantity of water either cold or hot, is run through successive portions of the material, so as to obtain a saturated, or at least a strong solution of sulphate of ammonia, and thus save subsequent evaporation. The lixiviated residue, being partially dried, and exposed to the air, becomes again fit for purifying gas, as mentioned hereinafter under the tenth head. The condensing or fixing vessels used for either of these modes, or for any other convenient method, may be open at the top to allow the uncondensed gases to pass off into the air; or they may be closed, and have an outlet waste-pipe carried into the chimney, or elsewhere. And, in any mode, those grids or perforated plates, with the charges thereon, forming the upper tiers in the vessels, may be used as the lower tiers when a fresh charge is supplied to the upper ones.

Superheated steam, atmospheric air that has been passed through coke, charcoal, or other carbonaceous matter at a high temperature, or other suitable heated gases, may be applied for separating ammonia and sulphur from "spent oxides," by carrying a pipe, coiled or otherwise, or several pipes, into, through, over, or under the spent materials in the distilling retorts, or elsewhere. Any available waste heat might be used to raise the temperature of the steam or other gas; and the arrangements for condensation of the ammonia and sulphur, and collection or extraction of the same, hereinbefore pointed out, could be retained; but in this system a larger cooling surface in the condenser is desirable.

2. The improvements relate to another mode or method of extracting sulphur from such oxides of iron. This is accomplished by pressure while the sulphur is in a state of fusion. The oxides are heated and agitated in a closed or partially closed vessel, until the temperature has been uniformly raised to about 250° Fahr. To obtain this temperature, a cylindrical vessel is used, which is fixed in an inclined position, and heated by a flue surrounding the same, or in any other convenient way. The

"spent oxide" is introduced by a hopper, and is carried onwards to the outlet, which is closed with a door by a spindle resting on bearings in both ends of the cylinder. This spindle is fitted with arms or vanes, set at an angle, or otherwise twisted, so that when the spindle is turned by hand or other power, they not only agitate the material being operated on, but they act as a screw, by carrying it onwards towards the shoot or outlet. The angle at which the cylinder is set and the speed of the spindle and arms, should be so adjusted that, when the material reaches the lower end, the sulphur will be thoroughly fused. When fused, it is placed in suitable straining or expressing apparatus; for instance, it may be placed in strong bags of woollen cloth or other fabric, enclosed and strengthened, if necessary, by nets of rope or strong cord, and passed between heated rollers, kept hot by jets of burning gas inside the same, or by other means, filtration or straining being performed in the operation. Or, the bags may be placed in a heated cylinder with a perforated bottom and sides, and pressure applied by a piston, perforated or solid. The same degree of heat is applied to the fusing and expressing apparatuses, both of which are enclosed as much as possible by suitable hoods chambers, or brickwork, to prevent loss of heat. The most convenien, heat is found to be from 240° to 250° Fahr.; and a temperature of not less than 230°, nor more than 280°, is recommended, as fused sulphut is in a very liquid condition within that range of temperature.

There are certain carbonaceous compounds derived from gas during purification, and contained in the "spent oxides" operated on, which are not easily separated from the sulphur obtained by fusion and pressure, and which give it a dark colour and objectionable odour. These impurities may be extracted from the sulphur by simple distillation or sublimation, and, to prevent the sulphur from boiling over in an impure frothy condition during the operation, a deep retort, relatively capacious, may be employed. Part of the impurities pass off as vapour, and the sulphur follows. There is left in the retort a quantity of finely-divided carbon, which is used as a pigment. In this process, superheated steam or other heated gas may also be used in the same way, as described under the first head, for fusing the sulphur in the said "spent materials." It is scarcely necessary to observe that this process cannot be recommended for oxides containing a small per centage of free sulphur.

3. The improvements relate to another mode or method of extracting sulphur from similar oxides containing free sulphur. The spent material is digested in hot oil, hot caustic potash, or turpentine. Solutions of sulphur are thus obtained, which, on cooling, deposit their sulphur in a solid form. The oils suitable for this purpose are the fixed oils, those generally known as paraffin, rock, and earth-oils, and other like hydrocarbons. Whether oil, potash, or turpentine is used, the crystalline sulphur is to be separated from the mother liquor by agitation, subsidence, and decantation. The crystals are then thrown on a filter or cullender to drain, or they are strained by pressure in any convenient way. The still moist sulphur is then to be heated and fused, preferably heated to a temperature between 230° and 280° Fahr., when the moisture will either pass off in vapour, or appear as a liquid on the surface of the sulphur, from which it may easily be separated when the latter has solidified.

4. The improvements relate to extracting salts of ammonia and iron from the oxides hereinbefore named, which contain these substances, by levigating or lixiviating with water, or by drying, grinding, and then lixiviating with water. To the material levigated or ground, if necessary, is added a sufficient quantity of water, preferably hot, so as to dissolve the salts of ammonia and iron. The oxides, sulphur, and other undissolved matters, are separated from the solution by subsidence and decantation, filtration and pressure, or either of them, or by any other convenient mode. The said solution may be treated for obtaining ammoniacal salts in a solid form in the usual way. Gas-liquor, or ammonia in any other available form, may be added to the solution, or to the dried and ground oxides, to decompose any soluble salts of iron which they may contain; if, on the other hand, the material is alkaline, it may be neutralized by the addition of a mineral acid—say, sulphuric acid. The insoluble residue may be treated for the extraction of sulphur, according to either of the processes under the first, second, or third heads.

5. The improvements relate to the utilization of the sulphur in the said oxides, by the obtainment therefrom of sulphurous acid gas. The material, either in a damp or dry state, but preferably slightly wet, is trodden, rammed, or otherwise compressed, until it can be cut or broken into lumps that will bear handling without too much disintegration. These lumps are then placed in a common grate, a furnace, or other suitable fireplace, and, when kindled, sustain their own combustion, the said fire being fed as required. The sulphurous acid gas is led into the vitriol-chambers or other apparatus in which it may be desired to use it. The burnt oxide drops or is raked through between the bars of the fireplace, and may be applied to various purposes herein-named. The ammonia, if the material contains ammonia, may be previously washed out of the "spent oxides," according to the process described under the fourth head. If the ammonia has not been previously extracted from the "spent oxides," it may be separated from the sulphurous acid gas by cooling, by a porous material, or by other suitable means or apparatus placed in the passage through which the sulphurous acid gas is carried on its way to the receptacle where it is to be used. This combustion process is specially applicable to those "spent oxides" which contain a considerable quantity of sulphur. But, if the sulphur has been previously extracted by distillation or sublimation, or if it has been fixed by heating in closed vessels, as described hereinafter under the sixth head, then the residue from the retorts, which is a sulphide of iron, may have its sulphur burnt off by any convenient means, and the sulphurous acid applied to the manufacture of vitriol or other purposes, according to known methods, as practised with iron pyrites.

6. The improvements relate to the treatment of bog-iron ore and other oxides of iron that have been used in purifying gas for obtaining sulphates of iron and ammonia. With this object, the material is heated without access of air, or with limited access of air or oxygen; a temperature of about 600° Fahr. answers well, but a dull-red heat is preferred, and much higher heats may be used. After heating it is cooled by wetting with water, or by any other means capable of preventing the injurious action of the air on it while hot. After being quenched or partially cooled, it is exposed to the action of rain (or water otherwise applied) and oxygen or atmospheric air, with or without the assistance of moderate heat and agitation, until the mass acquires a degree of pastiness or adhesiveness, or till the salts are observed to effloresce on the surface, or until it is known by any other test to be sufficiently acted on. It is then lixiviated, and sulphates of iron and ammonia (should the spent oxide contain ammonia) obtained in a solid form by evaporating the lixivium. The proportion of sulphate of ammonia thus obtained is influenced by the degree of heat to which the "spent oxide" has been subjected, low heats being the most favourable; but the ammonia may be previously washed out, as described under the fourth head. The excess of acid, if any, in the lixivium, or in the resulting salts, may be neutralized by the addition of iron or ammonia for the production of copperas or sulphate of ammonia. Should the "spent oxides" contain a larger proportion of sulphur than is necessary to convert the available oxides contained in them into sulphates, the excess of sulphur is extracted by any of the processes described under the first, second, third, or fifth heads, pereferably without superheated steam, or other heated gases, and the remainder is treated for sulphates, as hereinbefore set forth; or, there is added to the "spent oxide," previous to treating it, a quantity of oxide of iron, preferably hydrated oxide, or of metallic iron finely divided, equivalent in some measure to the excess of sulphur (which excess may be readily estimated with tolerable correctness by subjecting an average sample of the material to the distillatory process in a small porcelain retort), so as to obtain a maximum quantity of such sulphates; or, metallic iron is added in a fine state of division together with water, and the whole is ground quickly into a paste, keeping it in that state by agitation, and the addition of water, if necessary, or allowing it to remain at rest covered with water, or otherwise excluded from the air, until the desired chemical action takes place, that is, until the iron and the excess of sulphur have combined to form sulphide, which may be known by any suitable chemical test. It may be ascertained, for instance, by drying a portion of the mixture and digesting it in rectified naphtha, and evaporating the liquor, which will yield sulphur, if the sulphur in the mixture is still uncombined. The formation of the sulphuret or sulphide may also be effected by heating the oxides either after or simultaneously with the addition of the metallic iron, preferably to a temperature of from 250° to 600° Fahr. The sulphuret or sulphide of iron formed by either of these last two modes may be treated as above described, that is, for the production of sulphates of iron by heat, spontaneous or applied, preferably a heat sufficient to ignite the sulphide. In the case of the sulphides produced by these two modes, it is advisable that the ignition should be allowed to go on moderately, instead of being quenched with water, as directed for the sulphides formed from "spent oxides," heated in closed vessels. Those oxides of iron which have been most successfully treated under this head are the unmixed hydrated peroxides, both natural and artificial, and the unmixed magnetic oxide or magnetic "carbide of iron," and those quantities which were in the finest state of division, when originally used for the purification of gas, gave the best results. By "unmixed oxides" is meant those which are free from or contain the smallest proportion of "porous material" or earthy ingredients. When oxide of iron is used, therefore, with a view to its conversion into sulphates, the most finely divided oxides with the smallest proportion of or free from "porous material," or other matters having no affinity for sulphuretted hydrogen, are preferred. Oxides that have been mixed with any considerable proportion of caustic lime, or lime in any such combination that it will become caustic at a red heat, are not well suited to form sulphates of iron, as these salts are decomposed by caustic lime and other alkaline substances.

To produce sulphates of iron in quantity from "spent oxides" of iron, it is only necessary to apply heat so as to kindle the sulphur and cause it to burn slowly away, without too much disturbance, and at a moderate heat. Hence the process may be carried out by simply slowly burning the sulphides and "spent oxides," or allowing the spontaneous combustion of either of them to go on, preferably in masses or covered heaps, and lixiviating the residue according to well known modes practised in the manufacture of sulphates of iron and alumina from alum shale. There is generally, however, under this treatment a loss of sulphur, too much of it being given off as sulphurous acid gas, and too much of the iron being left in the state of free peroxide. The more the air is excluded in the first heating of the material, the greater the produce of sulphate of iron will be. It is therefore preferred to exclude the air entirely, as pointed out above, by heating the "spent oxide" in a retort, or other closed vessel, and quenching the resulting sulphides with water as withdrawn from the heating vessel, or allowing them to cool before being withdrawn. To produce sulphates of iron to some extent from the above-named sulphides, it is only necessary to roast or burn them with a moderate heat in the air, without too much disturbance, or allow their sulphur to burn slowly off by exposure to air while still hot, without quenching. But, in this case, also, there is generally an unnecessary production of sulphurous acid gas and peroxide of iron, and a corresponding deduction from the sulphate of iron desired. The excess of sulphur in raw "spent oxides" may also be burned off in any convenient way previous to applying such oxides to the production of sulphide or sulphate of iron.

The process which is preferred as the most advantageous consists in quenching the sulphides as they are drawn from the retort with water, and exposing the mass to the air while damp. It is laid in this condition in level heaps or beds, say about two feet deep, where, in general, it spontaneously heats, and frequently ignites from the rapid oxidation of the sulphide. This ignition ought to be immediately checked as often as it occurs, by slightly watering the material, and turning it over if necessary until chemical action has been so moderated that there is no further risk of ignition. When all heat has disappeared, and when, after turning over and damping a heap of the material slightly and uniformly, there is no renewal of heat, the process of conversion into sulphate may in most cases be considered to be practically complete. The progress and completion of the conversion may be known by lixiviating from time to time a given weight of the material in water so as to ascertain the proportion of insoluble matter, which will be found to diminish until the oxidation

of the sulphide has ceased. The use of applied heat for the production of the sulphate is advisable when the spontaneous production does not proceed satisfactorily.

If it is desired to increase the yield of ammoniacal salts, then there is added to the material to be lixiviated, or to the lixivium, ammonia liquor of gas-works, or ammonia in any other available form. The ammonia or ammoniacal compounds evolved while heating the "spent oxides" in closed vessels to produce sulphides may be utilized as directed under the first head.

The saturation and decomposition of the sulphate of iron material by ammonia are effected in various ways. It is laid on grids or perforated trays in the ordinary dry-lime purifiers in a pulverized and slightly damp condition, where it effectually frees the gas from ammonia. It may either be used in a separate purifier or set of purifiers, or in separate tiers in the same vessels with the ordinary purifying material. In the latter case, cocoa-nut matting, coarse sacking, or other open fabric, is laid under or over it to prevent admixture. It is also used for absorbing the ammonia given off from "oxides" undergoing revivification or ventilation, as described under the eleventh head hereinafter. It is likewise used for fixing the ammonia driven off by heat from oxides that have been used to purify gas, as stated under the first, fifth, and under this sixth head.

If ammonia liquor of gas-works is used, it is preferred to proceed as follows:—The volatile ammonia and ammoniacal compounds in the said liquor are driven off by boiling, as practised in the ordinary manufacture of sulphate of ammonia; but, instead of receiving the vapours or condensed steam into sulphuric acid, the steam is passed into the sulphates of iron, whereby they are decomposed, and sulphate of ammonia produced. The sulphate of iron is first pulverized, and generally it is found most convenient to mix it with damp sawdust, say from one-half to one-third of its bulk, or, which is better, with a damp oxide of iron in a state suitable for purifying gas. Either of these mixtures may be placed in a covered vessel or chamber, into which steam from the heated or boiling gas-liquor is introduced by a pipe, from which it passes through the material on the grids, where it is deprived of its ammonia, and then passes off by another pipe. It is desirable to avoid any great condensation of steam in the purifier or absorbing vessel, as too much water makes the material soft and pasty, less permeable to the gases, and difficult to deal with afterwards. This is guarded against, should it occur, by surrounding the purifier with some non-conducting substance, or by slightly superheating the steam as it leaves the boiler; but many other expedients may be used. As the process goes on, the material generally contracts, and, parting from the sides of the vessel, would leave a free passage for the steam in that direction, were it not barred or prevented by the projecting ledges which support or carry the grids. The oxide of iron, besides promoting porosity, will take up any sulphuretted hydrogen which might otherwise be passed off through the outlet into the chimney, or elsewhere, and such absorption would allow the outlet and the cover or lid to be dispensed with. When the steam, or a drop of water condensed from it, reddens turmeric-paper, the vessel may be discharged, and the upper part of the charge returned to the purifying vessel to form the lower part of the fresh charge of absorbing material. This returning of the material may be avoided, however, and the operation made continuous, by using a set of purifiers connected by a central change-valve, as in the purification of coal-gas. The sulphate of ammonia contained in the spent sulphate of iron material, produced according to any of the foregoing modes, is now to be extracted by lixiviation, and the oxide of iron recovered for the purification of gas, as set forth in the process of utilizing the ammonia under the first head. In evaporating the solution, the sulphate of ammonia, if any is present, will be more or less converted into sulphate. The resulting oxides, sulphurets, or sulphides, and carbonates, if any, may again be treated as above described, that is, after being again used for purifying gas.

7. Here the object is to produce alum and sulphate of alumina, or either of them, from "spent oxides" containing available alumina, or to which alumina has been added either before or after they have been used for the purification of gas. The oxides are heated without or with limited access of air, and the heated material is cooled, as described in the sulphate of iron. The material is then exposed to the weather, or to oxygen and water, preferably with the assistance of heat, until the desired chemical action has taken place. Instead of merely exposing the material to the weather, or to oxygen and water, after the first heating, it may be gently calcined or roasted in a somewhat similar manner to that adopted with alum shale. As with alum shale also, these two operations may be combined to produce sulphate of iron and sulphate of alumina in one operation. Ammonia alum (if the heat used has not been so high as to expel the ammonia), sulphate of alumina, and generally sulphate of iron, are obtained by lixiviating the material treated as above. The sulphate of alumina may be converted into potash alum or ammonia alum by the addition of sulphate of potash, chloride of potassium, or sulphate of ammonia, in the usual way, and these salts obtained by known means used in the manufacture of alum. If the sulphur in the "spent oxides" is in excess, and it is desired to utilize that excess, it may be removed, as pointed out under the sixth head, or the yield of sulphate of alumina and alum may be increased by the addition of alumina (preferably calcined) and metallic iron, or oxide of iron, finely divided; or alumina alone (preferably calcined) may be added to and heated with the material prepared for lixiviation, that is, the sulphate of iron material, or it may be added to the sulphide of iron or to the raw "spent oxide."

The process of manufacturing sulphate of alumina and alum from oxides of iron that have been used to purify gas from sulphur, and which contain available alumina, or to which alumina has been added, being substantially the same as that of the manufacture of these salts from the mineral, well known under the names of alum shale, alum schist, and alum slate, does not call for a lengthened description here. The sulphate of alumina may either be made from the sulphides of iron produced by heating the oxides of iron in closed vessels or chambers (preferably those sulphides formed at or under a dull-red heat), as described under the last head, or from the crude sulphates of iron of the same head, taken from the oxidizing heaps, or from the used oxides in their raw or original condition, with or without the previous extraction of the ammonia. The chief differences between the manufacture of alum from the substances just named and from alum shale arise from the frequent deficiency of alumina in those substances, which necessitates the addition of clay or other aluminous matter; and also, from their pulverized condition, which renders it advisable to adopt certain modifications in the mode of calcining. Those sulphides of iron containing alumina, which oxidize rapidly into sulphate of iron in the presence of air, and in mass heat spontaneously, especially if the heat rises to ignition, produce sulphate of alumina without further heating; but, if the proportion of alumina or other inert matter is large, or if, from any other cause, oxidation into sulphates proceeds too slowly, then it is desirable that they should undergo a gentle calcination. The material, being generally in a loose or pulverized state, is apt to choke the fires if calcined exactly in the manner of alum shale. To prevent the choking of the fires, it may be compressed with or without the addition of water, then broken into convenient pieces, and calcined either in the ordinary way, or in kilns such as are used for calcining limestone. When clay or other aluminous material has to be added to supply alumina, the mixture may be effected in a mill with edge-runners, or in a pug-mill; and the plastic mass dried, broken up, and calcined; or the clay may be first either dried or calcined, then mixed by passing through suitable screens, and the mixture damped and compressed previous to calcining. If the crude sulphate of iron material is used, and requires calcination and the addition of alumina, the mixture may be carried out as recommended for the sulphides, although it is preferred to calcine the aluminous material previous to mixing. When raw "spent oxides" are used for the production of sulphate of alumina, the mixture of alumina, if necessary, may be made, and the mixture calcined as directed for the sulphides of iron, but in this case it is prudent to raise the heat more slowly, so as to allow sufficient time for oxidation, and avoid unnecessary loss of sulphur. The sulphate of alumina having been formed by any of the above modes, the material is to be lixiviated with water, whereby a solution of sulphate of alumina, generally mixed with sulphate of iron, is obtained. Any excess of acid existing in this solution may be neutralized by metallic iron, and the liquor then treated for alum and copperas; all these steps, however, being essentially the same as in the well-known manufacture of alum from alum shale, need not now be detailed.

8. The improvements relate to the production of carbonate of soda and other compounds of sodium from the "oxides," throughout referred to. By substituting common salt for alumina, in the above (seventh) process, sulphate of soda, sulphuret of sodium, and other sodium compounds, are formed, which may be used for the manufacture of carbonate of soda, and for other purposes to which the said compounds of sodium are applicable. Muriate of iron and oxide of iron are products of this operation; such muriate of iron, when permanent, may be converted into oxide of iron and chloride of calcium, or muriate of ammonia, by mixture with lime or ammonia; and the chloride of calcium and muriate of ammonia may be recovered from the oxides and other insoluble matter by lixiviation, and the resulting oxide used for purifying gas. If desired, part of the sulphur may be removed from the "spent oxides" (as pointed out under the sixth head) previous to treating them for sulphate of soda. It is a disadvantage to have lime mixed with the "oxides" to be treated under this head.

Sulphate of soda is produced by heating together, in presence of air, the raw "spent oxides" and common salt, the sulphide of iron materia and common salt, or the sulphate of iron and common salt. In any case a very intimate mixture of the salt and the sulphur compound is desirable. A reverberatory furnace may be used for heating the mixture.

When either raw oxide or the sulphide of iron is used, it is preferred to grind these substances, when mixed with the common salt, into a paste with water, beginning the heating process at a comparatively low temperature, to allow time for oxidation, raising the heat gradually, and frequently turning over or stirring the mixture while being heated. The crude sulphate of iron may be mixed with the salt, either in its natural condition or wet, although it is advantageous to damp the mixture and allow it to remain in a heap for some time before heating it. Another mode is to dissolve out the sulphates of iron with the smallest practicable quantity of hot water, and, having thus obtained a concentrated solution, or having afterwards evaporated the solution to dryness, the sulphates are to be mixed with the common salt and heat applied. The sulphate of iron and common salt may also be mixed in solution, and the sulphate of soda obtained in a crystalline state by cooling the mixture, which leaves muriate of iron in the mother-liquor.

The formation of sulphates of iron from the sulphides, and the conversion of the former into sulphate of soda, may also be carried on to a certain extent simultaneously by mixing the common salt and the sulphides together, and exposing them, slightly damped, in a heap to the atmosphere. When spontaneous heat or chemical action in the heap has ceased or become languid, the process may be completed in a reverberatory furnace, as usual. The chlorine and muriate of iron, if any, and hydrochloric acid from these processes, may be utilized by condensing-towers, and other means already known.

By any of the above modes of operation, with the exception of the mode by mixed solutions, a mixture of sulphate of soda and oxide of iron is obtained. From this mixture either salt cake or crystallized sulphate of soda may be separated, by the usual means of lixiviating with water, and may then be applied to the manufacture of sulphuret of sodium and carbonate of soda, as heretofore practised. The remaining oxide may then be used for the purposes described under the ninth and tenth heads hereinafter mentioned. Or, the mixture of oxide of iron and sulphate of soda may be applied directly to the production of black ash, and the intermediate step of separating the sulphate of soda avoided.

9. The improvements relate to the application of the residual "oxides" and other materials from the foregoing processes to the manufacture of pigments. These oxides and other residual materials are heated with access of air, preferably in an oven or reverberatory furnace, until the combustible parts are sufficiently burned off; and they are then subjected to grinding, sifting, elutriation, or other known means for finely pulverizing

them; the residue from the sulphurous-acid process (fifth), however, and any oxides that may have been exposed to a red heat in the soda and alum processes, may be used as pigments without the burning herein described. It is desirable that the burnt oxides should be well washed, in order to free them from soluble salts of iron produced by burning off the sulphur, and also from ammoniacal salts (should the latter be present), which might impair the drying qualities of the pigments, and the permanence of their colours. It is preferred to effect this washing before sifting or bolting, in order to avoid the corrosion of the sieves by the salts to be washed out. The water used for washing the said oxides may be evaporated to obtain salts of iron and other substances. Any "spent" oxides of iron that may have had the sulphur burned off may be used as a pigment, as above described.

10. This invention relates to the treatment and application of the residual "oxides" and other materials from any or all of the processes before described, to render them suitable for repeated use in the purification of gas. The residuum from which the sulphur and other vapours have been distilled or sublimed under the first head is removed from the retort into water, or is immediately quenched with water, and is the better for being exposed to the air for a short time. The residue from which the sulphur has been expressed, as described under the second head, may be reduced to powder, damped, and then used with or without washing or further preparation. The residue from the third and fourth, the burnt oxide from the fifth, and the residue from the sixth, seventh, eighth, and from the ninth head (if any is available from the latter), may also be quenched or damped with water, if dry, with or without extra burning or washing, and applied for the same purpose. The crude sulphate of iron material from the sixth head may be intimately mixed with quick lime, the mixture exposed to the air, and then used to purify gas; or the mixture of sulphate of ammonia and oxide of iron from the same (sixth) head may be again used for purifying, previous to separating the suphate of ammonia. In all cases, the materials thus treated may be advantageously added to or mixed with "oxides" that have been partially "spent," so as to sustain their purifying power. It is preferred, however, where it is convenient, to pass the treated oxides through a bolting machine, or fine sieve, before using them for purification. Those "oxides" that have been subjected to a red heat, with the exception of the residual material from the seventh (alum) head, are to be heated again in clay retorts or other suitable receptables, and, in the absence of air, to a temperature sufficient to reduce the iron to a metallic state. The residue in the retort, or other receptacle, is then to be treated in the same manner as directed for the preparation of sulphates of iron from the sulphides of iron, under the sixth head of this specification. Hydrated oxide of iron is thus produced, which is more suitable for the purification of gas than the anhydrous peroxide. Another mode of treating the burnt oxides is to mix them with hydrated oxide of iron or with magnetic oxide or carbide of iron, either "fresh," or "spent," and use the mixture for purification.

11. Under this head the ammoniacal vapours given off by "oxides" while undergoing the process of revivification, are utilized by passing a gentle current of air through the reviving materials, and afterwards passing this charged air through any "porous material" that will absorb the ammonia. This may be effected in a simple and inexpensive manner, by placing the "fouled oxides," as they are removed from the purifiers, in shallow bins or chambers of brick or other suitable material, provided with false floors, bottoms, or tiers, say iron or wooden grids, or perforated plates or tiles, and connecting the same to a chimney draught or suitable machine, regulated to pass just sufficient air to renovate or renew the materials without injurious heat. From the reviving bins or chambers the air is carried by the same means through another bin, or through two, three, or more bins of like construction, but provided in addition with covers; these latter contain the porous absorbent. If the said absorbent is used in the same chamber as the "fouled oxides," on separate trays or in layers, coca-not matting or other open fabric may be employed to prevent the materials from mixing one with another. As soon as the absorbent has been sufficiently charged with ammonia, fresh charges are put in, the fouled material being treated for the extraction of ammonia, or used as a manure. Instead of placing the material to be ventilated in bins or chambers such as those just described, it may be laid in a closed apartment with openings to admit air enough for ventilation, the only exit for the air being through a bin or bins or other suitable receptacle containing the porous absorbent, where the air deposits, or is deprived of, its ammonia, and is thence drawn into the chimney or exhausting apparatus.

The patentee wishes it to be distinctly understood that, in this specification, he has indifferently, and for brevity's sake, made use of the terms "oxides used for purifying gas," "used oxides," "spent oxides," and "oxides," but, by these terms he does not mean "spent oxides," popularly so called, that is, oxides of iron that can no longer be profitably used for purifying gas in consequence of the large amount of impurity which they contain, but, with the exceptions herein named, all oxides of iron, including that oxide of iron sometimes called "carbide of iron," that have been used for the purification of gas from sulphur and ammonia, or either of them.

The claims are for—

1. A, the use of ordinary horizontal gas-retorts, that is, retorts which have been set or used for gas making, or retorts similar thereto, for distilling or subliming off the sulphur from "spent oxides" of iron that have been used for purifying gas, with the exception of the magnetic oxide and carbide of iron and spathose iron ore. This exception does not relate to any of the claims hereinafter stated. B, the distillation or sublimation of sulphur from "spent oxides" of iron that have been used for purifying gas, by means of vertical or inclined retorts, in which the process, if desired, may go on continuously. C, utilizing, by distillation and sublimation, the ammonia or ammoniacal compounds contained in "spent oxides of iron." D, the use of waste heat from the arches or ovens of gas-retorts for the above-named purposes of distillation and sublimation of sulphur and ammonia. E, the direct production, by distillation and sublimation, of "roll" or "stick sulphur" and flowers of sulphur from "spent oxides of iron."

2. The extraction of sulphur from "spent oxides of iron," by fusion and pressure.

3. The extraction of sulphur from "spent oxides of iron" by digestion in the liquids hereinbefore-mentioned under this head.

4. The extraction of ammonia and ammoniacal compounds from "spent oxides of iron" by lixiviating with water, substantially as hereinbefore set forth.

5. A, the production of sulphurous acid gas from "spent oxides of iron," by self-sustained combustion, substantially as hereinbefore described. B, the utilization of the ammonia given off by "spent oxides of iron," while burning, substantially as described under this head.

6. A, the production of sulphates of iron, directly from the "spent oxides of iron," when treated with limited access of air, substantially as described. B, the production of sulphides of iron by heating, in the absence of air, such "spent oxides of iron" as do not yield free sulphur by ordinary distillation or sublimation. C, the production of sulphides of iron from "spent oxides of iron" by mixing the latter with metallic iron, minutely divided, and water, substantially as hereinbefore set forth. D, the production of sulphides of iron from "spent oxides of iron" that contain an excess of sulphur by adding to them metallic iron or oxide of iron, and heating the mixture in the absence of air. E, the production of sulphides of iron from "spent oxides of iron," by adding metallic iron and fusing the sulphur in the mixture. F, the use or application of any or all of the sulphides hereinbefore mentioned, as obtained under the first and this sixth head, for the production of sulphates of iron. G, the application of "spent oxides of iron" for the manufacture of sulphate and sulphite of ammonia in the various modes, substantially as herein described under the sixth head.

7. The use of "spent oxides of iron," for the manufacture of sulphate of alumina and alum, either directly or by previous conversion into sulphide of iron, or into sulphate of iron.

8. The use of "spent oxides of iron," for the manufacture of sulphate of soda, sulphuret of sodium, and carbonate of soda, either directly or by conversion into sulphide of iron or into sulphate of iron.

9. The use of oxides of iron and other materials resulting from the foregoing processes under the first, second, third, fourth, fifth, sixth, seventh, previous and eighth heads, for the manufacture of pigments.

10. A, the use of the residual oxides of iron from the second, third, fourth, and sixth heads, for the purification of gas. B, the use of the crude sulphate of iron materials from the sixth head for the purification of gas. C, the use of the burnt oxides of iron from the fifth, eighth, and ninth heads (when any is available from the latter), for the purification of gas, after being treated or prepared for purification, substantially as set forth in the hereinbefore tenth head.

11. Utilizing the ammoniacal vapours given off by oxides of iron undergoing revivification, substantially by the means and apparatus herein described.

126.—Barrow Moss, of Liverpool, merchant, for "*The application of steatite, either alone, or in combination with, other substances, to the manufacture of bricks, fire- bricks, the lining of furnaces, and other similar purposes.*" Provisional protection only obtained. Dated Jan. 17, 1862.

This invention consists in the use of the material known as steatite, or soapstone, or silicate of magnesia, as found in its natural state, when applied to the manufacture of fire-bricks, fire-blocks, sieges for pots in glass-houses, and to the construction of iron furnaces, copper-smelting furnaces, and other like metallurgical operations, and the lining of furnaces generally.

The inventor, by preference, reduces the steatite to a powder, then moistens it with water, to which, in some cases, it is preferred to add a weak solution of potash or other chemicals, thereby forming a "slip" or plastic substance, out of which the articles to be manufactured are formed, by being pressed into matrices of the required form, by hydraulic or other powerful machinery, to give it the required adhesion and form; after which, the articles are baked or burned in the usual way.

In the formation of some of the articles named, and in lining furnaces, clay or other substances may be combined with the steatite.

136.—William Tice, of 16, Downham Road, Islington, London, for "*Improvements in gas-regulators and meters, part of which invention is also applicable for covering various descriptions of metal spindles.*" Provisional protection only obtained. Jan. 18, 1862.

1. This improvement in the diaphragms of dry gas-regulators and meters, consists in soaking such flexible diaphragm of whatever material it may be composed, in glycerine or other like substance, and afterwards coating such diaphragm with a mixture of treacle and glue or other saccharine and animal matter, reduced to a proper consistency for the purpose of preserving the flexibility and filling up the pores of such flexible diaphragm.

2. For all gas-regulators and such like instruments, in which various descriptions of metal spindles are used travelling in or through some description of metal, such spindles are either made of or covered with glass, porcelain, or other like material, and in the cover, or in such part of the instrument in which the spindle should work, is inserted a tube of glass, porcelain, or other like material, and the valves are made of, or covered with glass, porcelain, or other like material, or the valves and valve-seats are coated with an alloy of silver or other non-corrosive substance.

163.—Louis Martin, chemist, of No. 13, Rue Gaillon, Paris, for "*Improvements in the treatment of mineral oils, and in the apparatus connected therewith.*" Patent dated Jan. 22, 1862.

The first process by which the mineral oils—usually called petroleum, kerosine, rock-oils, or oils the products of schistes, or coals, peat, asphalte, or wood—are rectified and deodorized, consists in the use of caustic soda, mixed and agitated with the crude material, to which is subsequently

added a small quantity of tepid water. These ingredients are then allowed to subside, and the different matters separated, which will be precipitated. The oils thus treated are distilled; the light oils, which are the first to come over, being received in separate vessel. The distillation of the oil remaining in the still is continued at a higher temperature; and to these oils is afterwards added a certain proportion of colza or other vegetable or animal oils used for lighting purposes, as well as about a third of their volume of tepid water, containing chloride of sodium. These ingredients are agitated; and the oils are washed with water, acidulated with sulphuric acid, and subsequently in pure water. This process can be applied to manufacturing lubricating oil with the same materials by omitting the operation where sulphuric acid is used. Heavy schiste or shale-oils, as well as the heavy oils obtained from tar, can also by this process be converted into either burning or lubricating oils.

By a second process, in order to obtain oils fit for burning, the distillation of petroleum is commenced at a low temperature, in order to separate the benzole; and the distillation of the oils remaining in the still is continued at a higer temperature. A second distillation is then made of these latter oils, to which are added fatty acids, or oleine, or neutral fatty substances, such as tallow; pulverized lime being also introduced in the still.

By a third process, the lighter oils are first separated from the petroleum by distillation, and then the temperature of the oils remaining in the still being raised, the remainder is distilled over, and subsequently submitted to the action of chloride of zinc by agitation. The oils are then redistilled, introducing at the same time, in the still about 10 per cent. of lime.

When it is desirable that the still be heated by superheated steam, an apparatus composed of an outer-pipe is proposed to be used, one extremity of which is closed like a gas-retort, in which one or more pipes are placed, admitting steam to the closed extremity from whence it has to travel the whole length of this external pipe, before it can flow towards the still.

164.—Isaac Roberts, of Liverpool, contractor, for "*Improvements in combined hydraulic motive-power engines and meters.*" Patent dated Jan. 22, 1862.

This invention relates to that class of rotary engines and meters, where the cylinder is stationary and the piston, main-shaft, and radial wings or arms rotate, the said wings or arms receiving the direct pressure of the water. The cylinder rests on suitable framework in a horizontal position, and on the side thereof are formed the inlet and outlet-ports, between which there is an abutment projecting inwards from the inner periphery or internal surface of the cylinder, the said ports being controlled, if desired, by slide-valves, or other "cut-off" gear. The piston is also cylindrical, but less in diameter than the stationary cylinder, and has two or more longitudinal slots or openings therein for the radial wings or arms, and a boss or other arrangement for securing it (the piston) to the main-shaft, which latter rests on bearings in or near to the cylinder-ends. Within, and encircled by the piston, and surrounding the main-shaft is an eccentric-shaped cam, made fast by keys or otherwise to the cylinder's end or cover. This cam, with the assistance of fitting pieces eccentric to the axis, guides the wings or arms which move through the slots in the piston over the abutment above referred to, one end or edge of the said wings or arms bearing on the said cam, and the other against the cylinder, the contact being maintained by springs fitted in the wings.

For measuring and indicating the quantity of water or other liquid passed through the said combined engine and meter, it is simply necessary to place on the main-shaft, or any other working part suitable for the purpose, pinions with worm-wheel and multiplying arrangements of wheels and pinions, or catch and ratchet-wheel, or any other apparatus for transmitting and recording motion with indices easily read, many modifications of which are well known.

The mechanism for giving motion to the apparatus for registering the quantity of water passed through this engine may be conveniently fitted on the shaft; but, as such apparatus is well understood by mechanicians, it does not call for any lengthened description. It may consist of a tappet fastened to the shaft, which tappet, at every revolution, shall move a ratchet or other wheel; or, it may consist of a worm or screw to, or formed in such shaft-gearing, with a wheel. In both of these, or in any other arrangement, the ordinary system of multiplying by wheels and pinions should be used with suitable indices.

This combined engine and meter is specially suitable for use in large towns and other places where there is a good head of water, the motion being exceedingly simple. The water is admitted through the port by movement of the valve into the cylinder where it acts on the wings or arms, and causes them, the piston and the main-shaft, to rotate, the motion being taken from such shaft by means or apparatus suitable for the work to be performed. The claim is, the arrangement or combination of mechanism herein described, or any mere modification thereof, for the purposes set forth.

193.—William Johnston, of Glasgow, N.B., metal-merchant, for "*Improvements in lamps.*" Provisional protection only obtained. Dated Jan. 25, 1862.

This invention relates to lamps for illuminating shop-windows, halls, stations, and other places; and which are of the kind comprising a number of gas-jets, or other lights, arranged star-fashion, or in a circular or similar form, beneath or around or partly around a central reflecting-surface, or combination of reflecting-surfaces; and the invention comprises various improvements in forming, constructing, shaping, or arranging the details of such lamps.

In one modification of the improved lamps, the centre reflector is of a cylindrical form, of uniform diameter, or tapering slightly, being placed vertically, and with the lights arranged around it. An improvement, applicable to the cylindrical reflector, and to reflectors of various other forms, such as spherical, ellipsoidal, vase-shaped, and urn-shaped reflectors, consists in forming the reflecting-surface with a series of flutings, or so to present an indented outline in section, instead of the ordinary circular outline; and in disposing the lights so as to obtain a multiplication of reflections from such flutings.

In constructing reflectors according to this invention of forms, which are convex in general outline at the reflecting part, such as cylindrical, spherical, ellipsoidal, vase-shaped, and urn-shaped reflectors, and being with or without flutings, polished metallic surfaces are employed, such for example as thin sheet copper, prepared by well-known means, with a silvered or other external reflecting-surface. To prevent injury by the gaseous matters emitted at the lights, the reflecting-surfaces are protected by a vitreous coating or by a coating of transparent lacquer or varnish. In cases where very small cost is an object, the material used in constructing the reflectors may be tinned plate or zinc, the surface being polished and protected in the manner already mentioned. The reflectors may also be constructed of earthenware, of the kind known as "lustre ware," and this material may also be used in forming or ornamenting the other parts of the lamp.

217.—John Hunt, of Birmingham, brass-founder, for "*An improvement or improvements in the manufacture of gas and other chandeliers.*" Patent dated Jan. 28, 1862.

This invention consists, firstly, in manufacturing gas and other chandeliers of square or angular tubes, as hereinafter explained. In making a chandelier according to this invention, a series of the said square or angular tubes are bent into such forms that, when they are symmetrically arranged about a common axis, they form a skeleton or framing of the general figure, which it is intended the finished chandelier shall have. The tubes are fixed together by screwing, or brazing, or otherwise, and the chandelier is finished by the addition of such ornamental or other parts as the particular design of the chandelier may require.

The invention consists, secondly, in making chandeliers with the balance-weight central, and placed within the tubular framing of the chandelier, to which it is connected by means of two or more chains. This part of the invention is applicable to chandeliers the framing of which is made either of square or angular, or of cylindrical or other-formed tubing.

226.—William Edward Newton, of 66, Chancery Lane, London, civil engineer, for "*Improvements in engines to be employed for pumping or forcing air or water, or for other purposes where a rectilinear motion is required.*" A communication. Patent dated Jan. 28, 1862.

This invention relates to a novel or improved mode of arranging and working the valve-gear of the steam-cylinders of engines employed for pumping or forcing air or water. In carrying out the invention, it will be found convenient to arrange the working of the pistons in such a manner that, when one piston is at mid, or half-stroke, the other piston shall be at the end of the stroke. The operations of the valves and the arrangements of the ports for the induction and eduction of steam, are also so contrived that the exhaust of the steam from the cylinder may be arrested at such a point of the stroke as will prevent the pistons from over-reaching or striking against the heads of the cylinders. By this means the cranks, eccentrics, and fly-wheels, usually employed in steam-engines, may be dispensed with; and, when the invention is applied to pumping-engines, a more uniform and equal flow of water, or other fluid, at all points of the stroke is effected: the pistons will also be allowed to pause at the end of each stroke, thereby permitting the valves of the pumping-cylinders to close more gently and with less shock than they otherwise would.

The invention relates also to a mode of constructing a double-action pump, which consists of a rectangular or other conveniently-shaped case, which may be of cast iron and divided internally by a longitudinal partition into two separate pumps. These separate compartments are provided with a partition, in which is fitted a ring or metallic bearing to receive a long hollow reciprocating cylindrical box or piston, which is provided with a piston-rod that passes through a stuffing-box in one end the rectangular box or casing. The lower or under side of this box or case has a water-chamber secured thereto, and has a number of holes made therein, and which are covered with puppet-valves made to open inwardly. A similar chamber is adapted to the other or upper side of the box or casing, and is similarly provided with holes, which, being furnished with puppet-valves, opening outwardly, form so many exit apertures from the interior of the chamber. In carrying out the improvements, there are two steam or working cylinders, and two pumping cylinders employed, and the pistons of the pumping cylinders are connected to the pistons of the steam or working cylinders. Each steam or working cylinder is provided with separate valve-arrangements, and steam-ports, but the working gear of these parts is so arranged, that the induction-ports of one steam-cylinder are opened by tappet-arms on the piston-rod of the other steam cylinder, being made to come against levers connected by suitable rods with the valve-stem of the first cylinder. The induction-ports of the second steam cylinder are in like manner opened by means of tappet-arms on the piston-rod of the first steam-cylinder. The reverse action of the valves (that is for closing the induction-ports, and opening the exhaust) may be effected for each cylinder by its own piston-rod being made to act on the stem of its own valve by means of suitable arms and levers. The tappet-arms which operate upon both the induction and eduction-ports, are acted on by blocks which are adjustable at any point on the piston-rods. It will, therefore, be seen that the combined action of the working cylinders and pumps may be regulated and controlled at pleasure. The eduction-passages are so arranged that the piston will cut off the eduction-steam before it arrives at the end of the stroke, so as to confine a certain portion of the steam between the piston and the cylinder-head, and thus form a steam-cushion for the piston to strike against.

246.—Edward Alexander Rippingille, of Staple Hill, near Bristol, for "*Improvements in engines worked by steam, or other fluid, and in pumps.*" Patent dated Jan. 30, 1862.

This invention is applicable to those constructions of steam-engines wherein the injection-water in its way to the condenser, is caused to

enter a cylinder, and to act on a piston working therein, so that the power obtained thereby may be rendered available in the working of the steam-engine.

And the invention consists—

1. In applying an elastic piston in the injection-cylinder or engine to prevent concussion at the termination of the stroke, and also during the covering of the port by the valve.

2. In applying a chamber or vessel to the condenser in such manner that the injection-water from the injection-cylinder or engine shall be first received into such chamber or vessel, and then be by it delivered continously in numerous streams or jets, into the condenser; the chamber or vessel being of such capacity, and so arranged, as to retain sufficient water to keep up a supply to the condenser during one-half stroke of the piston in the injecting-cylinder.

3. In applying apparatus for refrigerating the condensed water from a steam-engine in combination with an injecting-cylinder or engine.

4. In a combined arrangement of air-pump and injecting-cylinder or engine (by which the air is withdrawn from, and injection-water is supplied to, the condenser) with a water-pump, for withdrawing the condensing water and condensed steam from the condenser.

5. In a mode of constructing steam-engine condensers, in which corrugated sheet-copper or other metal is used, bent or formed into annular vessels, one within the other.

263.—Charles Pontifex, jun., of 55, Shoe Lane, London, for "*Improvements in apparatus for cooling or heating fluids or liquids.*" Provisional protection only obtained. Dated Jan. 31, 1862.

This invention consists in the arrangement and application of a hollow disc or a series of hollow discs, of circular or other form, with or without the addition of a division-plate therein, such hollow discs or cases being contained in a conical or other-shaped vessel placed either in a horizontal or vertical position. Cold or heated fluid, or liquid, enters the apparatus at either end, from a central connecting-pipe or passage, and, after passing through the series of discs, or cases, it is discharged at the opposite end of the central pipe or passage. These discs or cases are supported within a conical or other-shaped vessel, and the fluid or liquid to be cooled or heated is passed through the containing vessel, and through openings formed through the discs or cases until the required temperature is obtained.

APPLICATIONS FOR LETTERS PATENT.

2805.—Jonah Davies, of Tipton, Staffordshire, ironfounder and engineer, and George Davies, of Tipton, aforesaid, ironfounder and engineer, for "*Improvements in rotary engines, rotary pumps, and rotary blowing-machines.*" Oct. 17, 1862.

2843.—Charles Webster, of Ilkeston Road, in the parish of Radford, Nottinghamshire, locksmith, for "*Improvements in self-acting fountains adapted for garden-engines, fire-engines, and for raising and forcing water from mines, wells, and other places.*" Oct. 22, 1862.

2846.—Henry Herman Kromschroeder and John Frederick Gustav Kromschroeder, both of Princess Terrace, Regent's Park, London, N.W., for "*Improvements in the manufacture of gas-meters, and in the manufacture of sheet metal suitable for gas-meters.*" Oct. 22, 1862.

2863.—Anne Jean Ferdinand Vigneulle-Brepson, of 30, Boulevart de Beaumarchais, Paris, architect, for "*A siphoidal cistern with water-reservoir for kitchen or other drains in communication with infected sewers.*" Oct. 24, 1862.

2869.—John Thomas Stroud, of Birmingham, Warwickshire, lamp and chandelier manufacturer, for "*Improvements in the manufacture of, and in the machinery and appliances for holding, drilling, turning, tapping, fitting and shaping certain parts of steam, water, gas, and lamp-fittings.*" Oct. 24, 1862.

2877.—William Clark, of 53, Chancery Lane, London, W.C., engineer and patent agent, for "*An improvement in the construction of the joints of cast-iron gas and water-mains and other pipes.*" A communication. Oct. 25, 1862.

2881.—Enrico Angelo Ludovico Negretti and Joseph Warren Zambra, both of Hatton Garden, Holborn, London, W.C., meteorological-instrument makers, for "*Improved apparatus for ascertaining or testing the explosibility of liquid hydrocarbons.*" A communication. Oct. 25, 1862.

2883.—Joseph Chattwood, of Bury, Lancashire, architect, for "*Improvements in ventilating rooms and cellars.*" Oct. 27, 1862.

2887.—Frederick Lipscombe, of 233, Strand, London, W.C., water-filter manufacturer, for "*Improvements in purifying water.*" Oct. 27, 1862.

2905.—Julius Jeffreys, of the Rise, Hoddesdon, Herts, for "*Improvements in constructing surface-condensers, and apparatus for heating and cooling fluids.*" Oct. 28, 1862.

2907.—Abraham Ripley, of Brook Street, West Square, St. George's Road, Lambeth, London, S., for "*Improvements in the construction of pistons for steam-engines, which improvements are also applicable to air and liquid pumps.*" Oct. 29, 1862.

2912.—William Clark, of 53, Chancery Lane, London, W.C., engineer and patent agent, for "*Improvements in apparatus for ascertaining and recording the speed and distance travelled by vehicles, the flow and quantity of water, and other analogous purposes.*" A communication. Oct. 29, 1862.

2915.—William Cooke, of 26, Spring Gardens, St. Martin's in the Field's, London, S.W., for "*Improvements in apparatus for ventilating.*" Oct. 29, 1862.

2917.—William Edward Gedge, of 11, Wellington Street, Strand, London, W.C., patent agent, for "*Improved apparatus in connexion with the pans of water-closets.*" Oct. 29, 1862.

2919.—Daniel Fryer, of Carlton Square, Old Kent Road, London, S., and Joseph William Mears, of Annett's Crescent, Islington, London, N., for "*Improvements in casks, tanks, or other receptacles for containing petroleum and other oils or spirits.*" Oct. 29, 1862.

2929.—John Eaton, of King's Norton, Worcestershire, chandelier-maker, for "*An improvement or improvements in the manufacture of certain kinds of gas-burners for illuminating purposes.*" Oct. 30, 1862.

2933.—James Birch, of New Norfolk Street, Islington, London, N., for "*Improved apparatus for unstopping or clearing from obstructions drains, water-closets, stach-water and other pipes.*" Oct. 30, 1862.

GRANTS OF PROVISIONAL PROTECTION.

2542.—William Clark, of 53, Chancery Lane, London, W.C., engineer and patent agent, for "*Improvements in the treatment of peat and peat tar for the production or manufacture of various products, and in apparatus for the same.*" A communication. Sept. 16, 1862.

2571.—Johan Bernhard Giertz, of Great St. Helen's, London, E.C., for "*Improvements in gas-burners or jets.*" Sept. 19, 1862.

2711.—Joseph Kaye Hampshire, of the parish of Whittington, Derbyshire, civil engineer, for "*Improvements in apparatus or machinery for washing coal, coal-slack, and other mineral substances, and separating foreign particles therefrom.*" Oct. 7, 1862.

2741.—James John Shedlock, of 63, Cambridge Street, Pimlico, London, S.W., for "*Improvements in gas-meters.*" Oct. 11, 1862.

2759.—Arthur Irwin Mahon, of 25, Leinster Square, Rathmines, Dublin, Ireland, for "*Improvements in propellers and paddle-floats, also applicable to the raising and forcing of water or other fluids.*" Oct. 13, 1862.

2770.—Richard Archibald Brooman, of 166, Fleet Street, London, E.C., patent agent, for "*Improvements in apparatus for carburetting gas.*" A communication. Oct. 14, 1862.

2785.—François Ferdinand Prud'homme, of 51, Rue de Malte, Paris, for "*Improvements in machinery or apparatus for raising water.*" Oct. 15, 1862.

2805.—Jonah Davies and George Davies, ironfounders and engineers, both of Tipton, Staffordshire, for "*Improvements in rotary engines, rotary pumps, and rotary blowing-machines.*" Oct. 17, 1862.

NOTICES TO PROCEED.

1714.—James Lovegrove, A.I.C.E., of Dalston Lane, Hackney, London, N.E., surveyor, for "*Improvements in apparatus for inspecting small sewers and drains, and for facilitating the removal of obstructions therein.*" June 9, 1862.

1774.—Richard Archibald Brooman, of 166, Fleet Street, London, E.C., patent agent, for "*Improvements in coking-ovens, in collecting and utilizing the products resulting from the distillation or carbonization of coal, and other matters producing coke, and in apparatus employed therein.*" A communication. June 14, 1862.

1787.—John Hunt, of Birmingham, Warwickshire, brassfounder, for "*An improvement or improvements in bronzing or colouring articles of copper or alloys of copper.*" June 17, 1862.

1822.—Joseph Walter Taylor, of Newsome, near Huddersfield, Yorkshire, for "*Improvements in valves, and in means for regulating and indicating the flow and pressure of fluids.*" June 20, 1862.

1831.—George Simpson, of Glasgow, N.B., civil and mining engineer, for "*Improvements in machinery for working, boring, and mining or excavating tools, and mine and other pumps.*" June 21, 1862.

2286.—George White, of Torquay, plumber, Francis Buckland, of Newton Abbott, auctioneer, and Charles Rees, accountant, of Newton Bushel, all in the county of Devon, for "*Improvements in the manufacture of water-closets.*" Aug. 14, 1862.

2708.—Alexander Forbes, of Canal Terrace, Aberdeen, N.B., for "*Improvements in connecting together parts of vessels formed of tin plate, and in the means or apparatus employed therein.*" Oct. 7, 1862.

2754.—Charles M'Carthy, of New York, U.S.A., for "*Improvements in automatic safety-valves.*" Oct. 13, 1862.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2317.—George Scott, "*Improvements in generating elastic fluids, and in the apparatus for that purpose.*" Oct. 12, 1859.

2329.—Thomas Barnabas Daft, "*Improvements in flexible valves.*" Oct. 12, 1859.

2359.—Robert Smith, "*The purification of water and other fluids.*" Oct. 15, 1859.

2434.—Hugh Greaves, "*Improvements in moulding and casting gas, water, and other pipes, sash-weights, and other articles, and in cleaning some of the same from the sand.*" Oct. 25, 1859.

Miscellaneous News.

WESTERN GAS COMPANY.

The Annual Ordinary Meeting of this Company was held on Thursday last, Oct. 30, at the Offices, Argyll Street, Regent Street—F. W. RUSSELL, Esq., M.P., in the chair.

The SECRETARY having read the notice, the seal of the company was ordered to be affixed to the register of proprietors.

The following report was read, and the accounts were taken as read:—

The directors, in submitting to the shareholders the statements of account for the year ending the 30th of June last, have to remark, that, although the gas and meter-rental for the first half year did not, as mentioned in the last report, exhibit a very satisfactory increase, yet the second half year not only made up the shortcoming of the first, but, owing chiefly to the supplies of gas furnished to the International Exhibition and the surrounding buildings at South Kensington, the return was so favourable that the increase of rental for the entire year was £2162 in excess of the increase of the previous year.

Notwithstanding the great depression in the price of coke, the return from which and other products was £6189 for the year 1860-61, the amount was for the past year £6320.

The year's working shows a satisfactorily progressive improvement and increase of profit. The balance at the credit of profit and loss account, after the payment of all charges, interest on borrowed capital, and the dividend declared in May last, is £15,578. 16s. 1d.

The directors now recommend the meeting to declare a dividend, free of income-tax, of 13s. per A share, and 3s. 9¾d. per new B share, which, allowing 10s. 3d. per A share, and 2s. 11¼d. per new B share, will make up an average dividend for the past year of £10 per cent., and a sum equal to 2s. 9d. per A share, and 10d. per new B share, will be paid off the amount of deficiencies of previous dividends within the six years allowed by the Metropolis Gas Act.

Messrs. Francis Edwards, Vandeleur Benjamin Crake, and Lightly Simpson, directors, and Mr. Thomas James Briggs, auditor, retire by rotation, and severally offer themselves for re-election.

Dr. *General Balance-Sheet, for the Year ending June 30, 1862.* *Cr.*

To Proprietors capital, viz.:—						By Permanent investment		£278,810 4 2
20,000 A shares (£10 each)		£200,000	0	0		Sundry debtors		22,108 12 10
10,000 new B ditto (£3 paid)		30,000	0	0		Stock in trade		6,315 11 9
					£230,000 0 0	Cash in hand		5,168 10 2
New B share loan account		£7,644	0	0				
Bonds and debentures		42,000	0	0				
					49,644 0 0			
Sundry creditors					16,673 15 10			
Unclaimed dividends					506 7 0			
Profit and loss					15,578 16 1			
					£312,402 18 11			£312,402 18 11

Dr. *Capital Statement, June 30, 1862.* *Cr.*

To Amount expended to June 30, 1861					£287,678 1 11	By Share capital, instalments on shares forfeited, interest on calls, Belmont estate, &c., to June 30, 1861		£239,995 7 10
Ditto expended from July 1, 1861, to June 30, 1862, viz.:—						Amount received on new B shares, in the year ended this day		13,537 0 0
Works extension on freehold land		£1,118	4	2		Balance received for rental, on completing districting arrangement in St. James's Parish, 1860		1,510 14 9
Ditto on leasehold ditto		9,645	2	9		Loans at this date		49,644 0 0
Siding at Kensal Green		450	8	0				
Main-pipes	£1,830 14 6							
Laying	1,185 18 4							
		3,016	12	10				
Service-pipes	£ 235 9 2							
Laying	281 18 6							
		517	7	3				
Reinstating roads		418	12	6				
Meters	£1,375 1 1							
Fixing	49 0 7							
		1,424	1	8				
Lamp-posts and lamps		215	16	7				
					16,806 6 2			
Balance					202 14 6			
					£304,687 2 7			£304,687 2 7

Dr. *Revenue Statement, June 30, 1862.* *Cr.*

To Coal					£31,957 16 9	By Gas	£70,861 14 6	
Wages, gas-making					6,206 15 4	Meter rental	1,975 4 6	
Water, oil, and sundries					1,344 13 2			£72,836 19 0
Works renewal					1,768 14 9	Coke	£3,432 12 6	
Restoring pipes and meters					1,231 6 11	Breeze	773 19 3	
Lamp lighting					1,063 13 6	Tar	1,853 18 9	
Repairing lamps					288 6 6	Gas liquor	259 16 7	
Direction, salaries, and collection					4,983 13 9			6,320 7 1
Rents, rates, and taxes					920 3 10			
Stationery and printing					206 13 10			
Incidental expenses					369 13 2			
Bad debts					350 11 6			
Contingencies					432 8 10			
Profit and loss (profit for the year, to June 30, 1862)					28,032 14 3			
					£79,157 6 1			£79,157 6 1

Dr. *Profit and Loss Statement, June 30, 1862.* *Cr.*

To Interest					£2,376 12 3	By Balance from June 30, 1861	£10,001 18 4	
First half year's dividend (declared May last), and income-tax					10,288 10 10	Less dividend (declared November, 1861), and income-tax	9,790 13 5	
Balance					15,578 16 1			£ 211 4 11
						Revenue (profit of year, to June 30, 1862)		28,032 14 3
					£28,243 19 2			£28,243 19 2

The CHAIRMAN then said: Gentlemen, as is customary on these occasions, I rise to address a few observations to you relative to the progress of our company during the past year. I may say, I do not think your works were ever in a more efficient state than they are at the present time—not only as they stand in their present condition, but as regards their capability of producing such large quantities of gas to meet the demands of the public; so that we shall not require a further expenditure of capital for some little time. Under a late Act of Parliament, we had a district assigned to us, and we are in duty bound to meet the requirements of that district, and we feel that we must treat the public with liberality; if not, serious charges will be brought against us. Now, gentlemen, with respect to our plant. As regards our retorts and their powers, taking into consideration the consumption this time last year, we have sufficient to produce 80 per cent. more gas than at the present moment, and 40 per cent. more than that which can possibly be consumed in the heaviest part of the winter—the whole of our retorts, in fact, are in excellent order. With respect to our exhausters, they are amply sufficient. You are aware that the plot of land adjoining our premises, some 6 acres, which we have obtained on moderate terms, will enable us to carry on our works to any extent. In the neighbourhood of this ground as years roll on it will continue to be built on, and the demand upon you for gas will be very large; and, as it is our interest to sell the greatest quantity of gas, we shall meet that demand in a liberal way, and encourage the consumption as much as possible. I cannot help stating, with reference to your secretary, that the compliment which you paid him last year, I believe you will have no hesitation in presenting to him this year, for his efforts in looking after the interests of the company, and which his long experience and high character entitle him to. Our engineer (Mr. Pritchard) is also well fitted, and deserves your approbation for the discharge of the duties of the office he fills. I find that the produce from coal this last year—the prices have been very little different to what they were in previous years. By proper arrangement, 8 per cent. more than last year has been obtained from coal, which is a very considerable increase, and in the wages, by instituting the same comparison, there is a saving of 10 per cent., that is to say, for a given sum spent in wages, we get 10 per cent. more work done. The cost for restoring retorts has been 30 per cent. less than last year. This is a proof that your engineer is "fully up to his work," and, at the same time, in selecting Mr. Pritchard we have done everything to serve your interests which is seen by the results. With these observations, gentlemen, I conclude by moving—"That the report and accounts now read, be received and adopted." I shall be most happy to answer any questions that may be put to me in reference to the report.

Mr. RHODES seconded the motion for the adoption of the report.

Mr. BOX: Mr. Chairman, I have some observations to make upon the motion for the adoption of the report. I fully fall in with your views regarding the improvement that has been made; and I have gone into the state of the accounts of the company for the last half year. I will read the results to the meeting; and you will see whether that report ought not to be carried. I will first of all commence with coals, where I find an increased consumption of 1939 tons over the quantity consumed during the corresponding half year. Then, there is a decrease in the price of coals this year—viz., 1s. 8¼d. less per ton than last year, which is a very considerable reduction.

Mr. COX: Then there is an important item—the expenditure bearing upon revenue. I find that some £4000 less has been expended this year than in the last in obtaining your rental. Now, I think, this will go a great way, both in my mind aud in the minds of the other shareholders, as a sufficient fact to show that the salaries of your secretary and engineer should be increased, Both the secretary and engineer having given the greatest possible attention in furthering the interests of the proprietors, I shall cordially support any motion for the increase of their salaries—believing as I do that it is to those two gentlemen we owe our present prosperous position.

The CHAIRMAN then put the motion for the adoption of the report, which was carried unanimously.

Mr. BRICKWELL: Might I ask whether you will require to increase your capital for the extension of your mains?

The CHAIRMAN: As far as the present consumption goes, the mains are fully sufficient to meet the demands; but, as the increased demand for our gas goes on in the district, so we shall increase our works. We do not anticipate any increase of capital for some length of time.

Mr. BOX: Is it your intention of making a call?

The CHAIRMAN: We have not discussed the question yet. The holders of the B shares will no doubt respond very readily to a call when made. I do not know that we shall make a call at present. I now move—"That the

meeting declare a dividend, free of income-tax, of 13s. per A share, and 3s. 9¼d. per new B share, which, allowing 10s. 8d. per A share, and 2s. 11¼d. per new B share, will make up an average dividend for the past year of £10 per cent., and a sum equal to 2s. 9d. per A share and 10d. per new B share will pe paid off the amount of deficiencies of previous dividends within the six years allowed by the Metropolis Gas Act."

Mr. RHODES seconded the motion.

Carried *nem. dis.*

Mr. GRAY: It will be in the recollection of the shareholders that, at the meeting held last year, I considered that the time had arrived when a greater remuneration should be given to your directors. The opinion which I then expressed was pretty generally responded to; and the chairman on that occasion expressed his opinion that it would be advisable for me not to press my motion until the subject had been taken into consideration. In deference to that opinion I withdrew my motion, fully intending at some future time to make a motion for the increase of their salaries. It will be admitted on all hands that a more satisfactory state of accounts of a concern like this was never submitted to a meeting. To the directors (the chairman more especially), and the other officers connected with the working of the establishment, we are mainly indebted for our present prosperous position. I move, therefore—"That an addition of £250 be made to the salaries of your directors."

Mr. BRICKWELL seconded the motion.

The motion was carried unanimously.

The CHAIRMAN returned thanks on behalf of himself and brother directors.

The retiring directors, Messrs. Francis Edwards, Vandeleur Benjamin Crake, Lightly Simpson, and the auditor, Mr. Thomas James Briggs, were then re-elected.

Mr. RHODES: Brother shareholders, I think we have abundant cause to thank the board of directors for the manner in which they have conducted the affairs of the company during the past year; and I have great pleasnre in moving that a vote of thanks be given to the chairman and directors.

Mr. HOWELL seconded the motion, which was carried unanimously.

The CHAIRMAN: Gentlemen, I have to repeat the thanks of the directors and myself for the kind manner in which you have spoken of our services; and I trust that we shall all meet you next year, and be entitled to a similar vote.

Mr. GUTCH said he was in expectation that some member would have followed out the suggestion of raising the salaries of the secretary and engineer.

Mr. RHODES: I had not forgotten; I was intending to move that.

The CHAIRMAN: Perhaps I had better explain, that it is through the directors that this company regulate the salaries of their officers. We are always glad to have this expression of opinion on the part of the shareholders, because it strengthens our hands in fixing the remuneration of our officers; and, from what I have said of the services of Mr. Barber and Mr. Pritchard, you may conclude that we are fully sensible of their claims.

GREAT CENTRAL GAS CONSUMERS COMPANY.

The Half-Yearly Meeting was held at the London Tavern on Friday, the 31st ultimo—Alderman DAKIN presiding.

The CHAIRMAN, after the usual preliminaries, read the following report:—

The directors have pleasure herewith to place in the hands of the proprietors the accounts of the ecmpany for the half year ending the 30th of June last, together with their report thereon, and upon the general condition of the company's affairs.

The directors are happy to draw your attention to the fact that, after paying all working expenses, including a suitable provision for repairs and depreciation of plant, as well as discharging the obligations for the period, arising out of the Wood Street fire and the arbitrators award, there remains for shareholders profit the sum of £12,580, out of which the directors recommend a dividend at the rate of 8 per cent. per annum, free of income-tax, payable on and after the 19th day of November next, after which there will remain a balance of £1256. 11s. 8d., to be carried to the next half year's account.

By comparison with the receipts for the corresponding half year, it will be seen that the rental has increased by the sum of £3876. 0s. 5d., and, although the larger portion of this amount is due to the increased price obtained, there still remains a very satisfactory increase of rental as compared with former years; the diminution in the amount of receipts for products sales similarly compared, is due to the extraordinary and altogether exceptional circumstances which ruled in the early part of 1861.

During the summer, the 36-inch main was laid from Mile End to the City, and is now in operation. The work has been carefully and satisfactorily performed, and the directors are persuaded that the outlay will be amply repaid by the larger and more regular supply of gas to the consumers, and by the diminution of leakage.

In the last report it was stated that the Court of Common Pleas had given an unanimous decision that this company came under the operation of the Metropolitan Gas Act of 1860; since then, however, the Commissioners of Sewers have removed the case, by writ of error, to the Exchequer Chamber; it was partly heard on the 21st of June last, but, being the last day of term, the court intimated that the further hearing would take place in November next. The directors are still advised there is but little probability of the judgment of the Court of Common Pleas being reversed.

The company's engineer reports the works to be in a highly-efficient condition for the present and future supply. The quality of the gas has been fully equal to the requirements of the Metropolis Gas Act, and satisfactory to the consumers generally.

The capital and revenue accounts subjoined were taken as read.

HALF-YEARLY STATEMENT OF ACCOUNTS,

Showing the Actual State and Condition of the Concerns of the Great Central Gas Consumers Company, for the Six Months, ended the 30th Day of June, 1862.

I. CAPITAL.—*State of the Account at the End of the above Six Months.*

Statute, or authority, under which raised.	Number of Shares.	Amount per Share.	Paid up per Share.	Total paid up.	Total capital.
Shares	18,538	£10	All.	£185,380	£185,380 0 0
			Rate per Cent.	Amount.	
Borrowed moneys			5	£66,000	66,000 0 0
Profits capitalized					None.
			Total capital		£251,380 0 0

II. REVENUE.—*Account of all Sums actually Received and Paid during the above Six Months.*

RECEIPT.

Balances brought forward—		
Reserve-fund	£10,704 7 7	
Revenue account	1,525 11 7	
Dividend ditto	5,164 16 0	
		£17,394 15 2
Sale of gas—		
Common gas, at 4s. 6d. per 1000 feet	33,141 7 3	
Public lighting and under contracts	3,384 7 5	
		36,525 14 8
Ditto of old materials		38 6 11
Ditto of residual products—		
Coke and breeze	£7,087 16 2	
Tar and ammoniacal liquid	1,760 7 9	
		8,848 3 11
Miscellaneous receipts		4 2 6
Total receipt		£62,811 3 2
Ditto expenditure		61,554 11 6
Balance to revenue next account		£1,256 11 8

EXPENDITURE.

Management—		
Directors allowances	£ 500 0 0	
Salary of secretary and clerks	692 11 0	
Collectors commission and pay	331 2 10	
Rent, rates, and taxes of offices	127 12 9	
Stationery, printing, and general charges	520 5 7	
Payment to auditors	75 13 3	
		£2,247 5 5
Manufacture of gas—		
Coals, including carriage, dues, &c.	£16,200 13 1	
Purifying materials	488 1 7	
Supervision and labour	4,737 15 10	
Tools and other implements	928 6 4	
Ordinary repair, and maintenance of premises	817 3 4	
Rents, rates, and taxes of manufactory	523 8 8	
		23,695 8 10
Distribution, including service-mains, pipes, ordinary repair and maintenance, &c.	£3,416 12 8	
Meters—		
Restoring and replacing	609 5 1	
		4,025 17 9
Interests paid from profits, on £66,000 borrowed capital, at 5 per cent.	1,650 0 0	
Wood Street fire	3,500 0 0	
Arbitrators award	517 10 6	
Reserve-fund for contingency, wear and tear, or other purposes	13,338 9 0	
		19,005 19 6
Balance for shareholders profit		12,580 0 0
Total expenditure		£61,554 11 6

III. DIVIDENDS.—*Account of all Dividends actually Paid in the above Six Months.*

Balance for shareholders profit as above	£12,580 0 0
Dividends on £172,160 capital stock, 6 per cent.	£5,164 16 0
Balance to next half year's account	7,415 4 0
	£12,580 0 0

We have examined the above accounts, and certify them to be correct.

THOMAS DAKIN, *Chairman.*
R. M. MASSEY, *Secretary.*

The CHAIRMAN: Gentlemen, I think that the report I have just read, you will consider as perhaps as satisfactory a report as we have ever had to present to you, and one advantage arising out of that circumstance is, that it will not be necessary for me to trouble you with many remarks on this occasion. You will have perceived by the statement of accounts, which accompanies the report, the precise financial condition of the company. You will observe, by reference to the capital account, that there has been added to the capital, in accordance with the recent vote of the shareholders, a sum of £13,220, which has raised our capital to £185,380. You are aware that the additional amount was voted for the purpose of laying the new main from Mile End to the City, which has been satisfactorily done, and likewise to provide for the working capital of the company, which was necessary in consequence of its becoming a manufacturing company, instead of a company trading upon gas manufactured for, and supplied to it. You will perceive that the accounts, which correspond in form with those brought before you at the last half-yearly meeting, and which form has been prescribed by the Secretary of State under the provisions of the Act of Parliament upon all the gas companies of the metropolis—I say you will perceive from these accounts at once the state of the affairs of the company. We have here the balances brought forward on the debit side: the reserve-fund, £10,704; the revenue account, £1525; and the dividend account, £5164; making a total of £17,394. You will then see a very important entry, which consists of the amount of the gas-rental for the half year, which, the private and public lighting being added together, reaches the very respectable sum of £36,525. 14s. 8d. The last year's rental was £61,882. 18s. 4d. as you will see by reference to the former account. Therefore, if you take this half year as giving a moiety of the present year's rental, you will find it amounts to upwards of £73,000, and that, as compared with the rental of last year, is very satisfactory.

A SHAREHOLDER: But it arises partly from the 6d. advance.

The CHAIRMAN: Decidedly; but it is satisfactory to state to the meeting that, independently of the addition made to the rental by the increase in price, there is a considerable advance in the amount of the rental itself. I may state that that increase in the past half year is upwards of £1500. The items on the other side of this account are very much on all fours with those of previous accounts. The cost of the manufacture of gas during the half year is £23,695. The total cost for last year was £46,426. 10s.; so that, although we have a larger rental produced, we have only a very small increase in the half of the amount of the previous year's expenditure under this head, showing that the manufacture is being carried on in a very economical manner. I may state here that we have lately made a fresh contract for coals, which is of a very favourable character, and which will further have a tendency to reduce the future cost of gas, and so add to the profits of the company. The distribution account, including service-mains, pipes, ordinary repair and maintenance, &c., amounts during the half year to £4025; whereas, the total amount of expense last year under this head was £5668. We have thus necessarily incurred a larger expenditure during the last six months than during the whole of the preceding twelve months; and yet we have the respectable balance of £12,580, which we shall have to deal with presently, in the shape of dividend. Those little figures which you will perceive at the termination of the account, show that we can give you a dividend at the rate of 8 per cent. per annum; and carry over as a balance to the next account, £1256. 11s. 8d. And this, you will observe, is after providing £3500 for the Wood Street fire payment; and £517. 10s. 6d. to meet the current claim under the arbitrators award. Notwithstanding these heavy weights upon the resources of the company, it is very satisfactory to find that our business is of such an elastic character that we can give you an 8 per cent. dividend, and carry forward so large a balance. The only other matter I have to speak about is, that the large main for which the increased capital was chiefly voted has been very successfully laid without the slightest hindrance or injury of any kind, and it is now in full operation, to the great satisfaction of the manager and to our consumers at large. The engineer has ascertained that the laying down of that main will save us two inches of initial pressure, and very much increase the facility and power of the works. Indeed, he states that it will practically give another gasholder to the company, by enabling us to empty one gasholder entirely on Friday and fill it again on Monday morning. So that that outlay has made a great addition to the power and efficiency of your works, and will likewise prevent any complaints on the part of the consumers under any circumstances of a deficient supply of gas. The only other matter I have to state to you is with regard to the lawsuit. That is the only little cloud which still hangs over us, and, though we have every reason to believe that the unanimous judgment of the Court of Common Pleas will remain undisturbed, yet the directors think it very desirable that they should provide for the possible contingency of a reversal of their expectations. Your directors will therefore be prepared to give the necessary notices in Parliament during the ensuing month, so that if it should happen by any of those unseen uncertainties of the law, that the court above should take an adverse view of the wording of the Metropolis Gas Act of 1860 to that taken by the Court of Common Pleas, we shall have the means of going before the Legislature, who, we are persuaded, will do us justice and repair any unintentional oversight in the provisions of that Act. We say oversight advisedly, because it never could have been the intention of Parliament to put upon any company a considerable increase of obligation without giving to them what they equitably look for—that is, a corresponding increase of price; and, on the other hand, they would never pass a general Act regulating the supply of gas to the metropolis and apply it to nine of the companies, leaving the tenth to be an exception. I am sure I may say that, having very carefully watched the course of the arguments and of the judgment in the court of Common Pleas, I am persuaded that if the Court of Exchequer Chamber come to any contrary conclusion, it will be because the judges feel that they are compelled to do it, and not because they think the justice of the case calls for it. We shall, therefore, as I say, carefully attend to this matter, and in the ensuing month shall be prepared, if needs be, to give the necessary notices to Parliament, in order that the defect in the Metropolis Gas Act may be put right by a short declaratory statute. I do not know that I have anything more to say to you, and I will therefore move—"That the report and accounts, as circulated among the proprietors, be received and adopted, and that a dividend be now declared for the half year ending the 30th of June last, at the rate of 8 per per cent. per annum, free of income-tax, payable on and after the 19th day of November next."

Alderman GABRIEL (Deputy-Chairman) seconded the resolution.

A PROPRIETOR: What further sums of money will have to be paid on account of the Wood Street fire?

The CHAIRMAN: There is yet £19,000 to be paid, and that is payable in four yearly instalments of £4750, on the 1st of July in each year, terminating in 1866. It was £25,000 originally that we had to pay, and we have paid off £6000.

Mr. FOXALL: How many more payments have you to make to Mr. Croll?

The CHAIRMAN: Mr. Croll's account stands thus. There now remains unpaid the sum of £3105. 3s., which is payable in six half-yearly payments of £517. 10s. 6d, on the 1st of January and the 1st of July in each year, terminating in 1865.

A PROPRIETOR: Allow me to ask this question. Have we no bad debts? I do not see any item of the kind in the accounts.

The CHAIRMAN: No; there is not. The bad debts are not stated in the parliamentary form of account. You have here the net amount of the rental, instead of the gross. The bad debts are much the same as usual. We are reducing them to the utmost of our power, and avoiding them as much as we can.

The motion for the adoption of the report, and declaration of dividend was then put, and carried unanimously.

Mr. C. NICHOLSON: I suppose, sir, I am right, in considering that this concludes the ordinary business of the meeting.

The CHAIRMAN: Yes; that is all.

Mr. NICHOLSON: Then I beg to move, and, I know that, in so doing, I shall have the concurrence of the entire meeting, a vote of thanks to the chairman and the board of directors for their excellent management of this concern during the past half year. And, in doing so, I would venture to make a remark or two. I would not interfere with the carrying of the report by any observations upon the unfortunate lawsuit we have on hand, because I thought it better that that report should pass, if possible, without comment of any kind. But, in proposing a vote of thanks to the directors, I cannot help expressing my obligations to them, and in doing so, I believe I express the feeling of the proprietors generally, for the precaution which they inform us they have taken in preparing the necessary notices to Parliament, for a bill in the ensuing session to enable us to continue the 4s. 6d. price, in the event of any contingent disadvantageous decision in the Court of Exchequer Chamber. It is hardly to be supposed that that court will reverse the unanimous judgment of the Common Pleas, but everybody knows "the glorious uncertainty of the law." I am sure, therefore, we all entirely approve of the course proposed by the directors, and thank them for their foresight and precaution in taking steps to bring the subject under the consideration of the Legislature. We are quite sure, at any rate, that if we do not get justice and equity in a court of law we shall not fail to get it at the hands of the Legislature. It never could have been contemplated that an onerous duty should be imposed upon the company, the duty of giving increased power and purity of gas without affording them an adequate remuneration for the additional service thus rendered to the public. I will not detain the meeting longer than to say that I have great pleasure in moving the resolution.

A PROPRIETOR seconded the motion, and suggested the addition to it of a vote of thanks to the officers of the company.

The motion as amended was very cordially adopted.

The CHAIRMAN: Gentlemen, I am sure we are very much indebted to you for your kindness in thinking so well of us. I have the comfort of reflecting that we do, to a considerable extent, deserve your confidence and thanks. We have sometimes very arduous duties to perform, and I assure you that we give our best attention to the discharge of them. We are all in the same boat with you. I believe that on this side of the table we hold a large proportion of the capital of the company; and, therefore, both our interest and our duty coincide in making us faithful and diligent. The times are gone by when the duty we had to perform was painful, as well as arduous. I have had to meet you when we have had to report heavy losses, quarrels, and disturbances; and, on one occasion, to propose a dividend of only 1½ per cent. But on all those occasions, I recollect, with gratitude, that you always received us with the same kindness and consideration that you now do that we are in prosperous circumstances. It is very easy for your chairman and directors to come here with such a report and balance-sheet as we have just presented; and it is pleasant to them to be able to recommend an 8 per cent. dividend, and hold out to you a good prospect for the future. I say it is comparatively easy; and we expect you to be good-humoured, kind, and complimentary. But I remember the time when it was not so; and I associate with that remembrance the thought that then you were equally kind, generous, and considerate. A gentleman at the back of the room has very properly suggested that in the vote of thanks the officers of the company should be included. A board of directors without able and efficient officers would have their troubles multiplied, and their anxieties much increased. I must say, for our excellent secretary, Mr. Massey, that, whether in season or out of season, he is most diligent and attentive to the duties of his office; and your directors have the utmost confidence in his integrity, his talent, and industry. Our friend, the manager, who is behind me—who is not so old a servant of the company—has certainly deserved well at your hands and ours, for the very careful manner in which he has conducted our affairs. We were down at the works this day week; and I must say that I never saw the gas-works at Bow under such pleasant circumstances as I did then. Everything was in good order; and everything seemed working in perfect harmony. When we were coming away, some twenty of our stokers made their appearance, in bright and brilliant uniform, and with their brass band played us, in good time and tune, several very excellent pieces of music. Altogether, the general aspect of affairs was such as gave us great satisfaction; and reflected the highest credit on our friend, Mr. Harris, the manager. Gentlemen, I will only say that, on the part of our officers—the secretary, manager, accountant, and others—as well as on our own, we beg to thank you most sincerely for the mark of your confidence just paid to us.

METROPOLIS GAS SUPPLY.

CITY COURT OF SEWERS, GUILDHALL, TUESDAY, OCT. 21.

At the Meeting of the Commissioners, this day—Mr. DE JERSEY in the chair,

The CHIEF CLERK read a letter, dated from Tower Hill, in which the writer, whose signature it was found impossible to decipher, stated that, having often to return home late along Eastcheap, Great Tower Street, and Trinity Square, he observed that the light afforded by the public lamps was very defective. He attributed the evil to the large tin boxes fixed in the centre of the lanterns, which prevented the light from the burners falling upon the pavement. He stated that, in one lamp in that locality, which the commissioners had recently had fixed upon the old system, the light was two or three times greater than in those to which the carburators were attached. As the neighbourhood was, at the best of times, not the most respectable after nightfall, and he had himself been accosted in the dark streets by disreputable persons, he felt it right to call the attention of the court to the subject, in the hope that some remedy would be applied to the evil complained of.

The CHAIRMAN thought it would be advisable to refer the letter to the General Purposes Committee, to examine into the grounds of complaint.

Deputy HARRISON objected, believing that the letter had been sent in joke, there being no precise address to it, and the signature being unintelligible.

Mr. J. T. YOUNG thought it ought not to be regarded as a joke, and that there was some reality in the complaint. He was constantly hearing of the defective light furnished by the public lamps to which the carburators were attached. Certainly, the lamps gave much less light than formerly.

The CHAIRMAN said it was, perhaps, not all due to the carburators. The General Purposes Committee were inquiring into the subject very carefully, and with very great anxiety, for it was a difficult question.

Dr. ABRAHAM said, the court could not take any notice of a letter of this sort, the signature to which could not be made out. His opinion was, that it had emanated from a shareholder of the Great Central Gas Company. He could easily imagine that a trick of that sort might be played; for, no doubt, the Great Central Company were at the bottom of all the complaints made about the carburetting process. If that company would only supply the proper quantity of gas which they contracted to do, the carburetting process would answer every purpose, and the public would be satisfied; whereas now there was general public discontent. It all arose from the two companies being in opposition one to the other; so that the Carburating Company had not the slightest chance of making their invention at all useful, for the Great Central opposed them at every turn. The present state of things must not and could not continue much longer; and he maintained that, when the commissioners burned gas in the public lamps by meter—and this, he believed, they would soon see the necessity of doing—they would be able to try any process that science might suggest for the advantage of the public. Until then, however, these complaints respecting the opposition of the Great Central Company would continue, to their annoyance and injury.

Deputy HARRISON said that, as the letter which had been received did not contain either the name or the address of the writer properly or legibly written, the best way would be to order it to lie on the table; and he would, therefore, move to that effect.

Deputy ELLIOTT did not think the commissioners ought to have their time taken up with this matter; but, at the same time, it was not, in his opinion, fair to thrust the blame upon the shoulders of some shareholder of the Great Central Gas Company. He should judge, from internal evidence, because the writer spoke of being out at all hours of the night, that the letter came from a medical man. (Laughter.)

Deputy LOTT quite agreed that their time should not be taken up with the letter, but he did not think that the reading of it should have called forth such strong observations from his learned friend, Dr. Abraham. As, however, the carburetting process had been again referred to, he would tell Dr. Abraham, and every member of the court, that that process was a complete failure. The company had had an opportunity of making their experiments upon the lamps, and the only result was, that they had nearly blown themselves up, lanterns and all. (Laughter.)

Deputy WATERLOW thought the court should treat the letter as an anonymous communication.

Mr. J. T. YOUNG observed that several letters had been sent to the court, complaining of the carburetting system, one recently having been received from the churchwardens and inhabitants of Walbrook upon the subject.

Mr. C. YOUNG: Yes; but they appended their names to the letter.

After some further observations, the motion, that the letter do lie on the table, was agreed to.

DISTURBING THE PUBLIC WAYS.

Mr. J. E. SAUNDERS said he wished to call the attention of the commission to a subject of some importance—viz., the practice of the water and gas companies disturbing the pavements and public ways, for the purpose of relaying or repairing their pipes. He alluded specially to a recent act of this kind by the New River Company, in taking up a portion of the public way in London Wall, the consequence of which had been that Mr. Pullen, one of the inhabitants, had been greatly incommoded, not having been able to get his carts in or out of his own gateway. He thought it most desirable the commission should know if they had any power to interfere in matters of this kind; and, if they had, it was then their duty to put the remedy in force.

Inspector FLOOD, in answer to questions, said that the usual notices had been given by the New River Company to take up the pavement.

The CHAIRMAN said that, as that was so, the court could not interfere. He advised Mr. Pullen to apply to the New River Company upon the subject.

TUESDAY, OCT. 28.

The General Purposes Committee brought up a report, in which they stated (*inter alia*) that their attention had been drawn to the charges made by the Great Central Gas Consumers Company, for the gas stated to have been consumed by the public lamps over and above that required by their contract, which was for lamps at £3 per annum for 3-feet burners. The committee stated that they had very carefully considered the question, and found that, in consequence of the Carburating Company not being in a position, at the commencement of their contract, to apply their process to all the lamps lighted by the Great Central Company, an additional quantity of gas was for some time consumed in many of those lamps, which the gas company had charged for at the rate of 4s. 6d. per 1000 cubic feet—that being the sum charged by them under the Act of Parliament to private consumers—whereas the proportionate price upon which their tender was framed and accepted for the City public lamps appeared to be about 3s. 9d. per 1000 feet. The total amount of these extras in the bill for the quarter ending the 30th of April last, was £723. 17s. 4d. Upon a careful examination of the bill, the engineer to the commission deducted therefrom as overcharge the sum of £115. 13s. 5d., that being the difference between the charge of 4s. 6d. per 1000 and the 3s. 9d. which he considered should have been charged; but to this deduction the Great Central Gas Company demurred. The committee, therefore, requested a deputation from the board of directors of the gas company to attend them, and explain their reasons for this extra charge; and, having been attended by Alderman Gabriel (the deputy-chairman) and the accountant, they stated that the extra charge had been made to meet the extraordinary expense to which the company had been put, in consequence of the introduction of the carburetting process, and the want of due arrangement and preparation on the part of the Carburating Company, whereby great delay in the application of their process to the public lamps was occasioned, and much extra cost incurred by the gas company. After a long conference on the details of this question, the committee considered that, under the peculiar circumstances of the case, it was advisable to arrange the matter by a reasonable commutation of the same charge, which they were happy to say they had effected. The Great Central Company had, through their deputy-chairman, agreed to compound the difference in the costs and charges in question for the sum of £80, instead of the £115. 13s. 5d., in the bill to the 30th of April last; and they had also agreed to a proportionate reduction in the like charge in the bill just delivered for the quarter ending the 30th of June; which bills the committee had instructed the engineer to examine and pass—and they now recommended the court to pay the same accordingly.

The report was adopted.

A letter was read from an inhabitant of Ludgate Street, complaining that, after the shops were shut, the neighbourhood was almost in darkness, owing to the deficient light from the public lamps, which the writer attributed to the adoption of the carburetting process.

The letter was referred to the committee.

STOREAGE OF PETROLEUM.

METROPOLITAN BOARD OF WORKS, FRIDAY, OCT. 24.

At the Meeting of the Board held this day—Mr. J. THWAITES in the chair,

The CLERK read the following report from the Streets Committee:—

Your committee have to report that they have again directed their attention to the subject of the arrangements for carrying out the provisions of the Petroleum Act, and it appears to them desirable, before your honourable board come to a decision on an application for a licence under the Act, that an opportunity should be afforded to the occupiers of premises adjacent to those in respect of which the licence is applied for, of stating to the board any objections they may entertain to the granting of the licence, and with that view your committee recommend—"That, in the case of all future applications to the board for licences under the Petroleum Act, notice of such application be given by the superintending architect to the occupiers of premises adjacent to those in respect of which licences have been applied for."

Mr. PHILLIPS, in moving the adoption of this report, said that the object of the Streets Committee in making this recommendation was, that every one of the persons most interested in having such a dangerous combustible as petroleum stored in immediate contiguity to their premises, those persons being, of course, the occupiers of those premises, should have due notice given them by the superintending architect of all future applications for licences, in order that they might be afforded full opportunity of reporting to the board their objections to the granting of such licences, if objections upon their part were really entertained. The committee felt that some such general recommendation as this was particularly called for under the circumstances of the case, as well as under the provisions of the Act, and he was quite sure that that recommendation would meet with the approval of the general board. The object they must all have in view was to carry out the intentions of the Legislature in passing the Act of Parliament in as fair and straightforward a manner as possible. In doing so, he conceived that the most open and above-board way of granting licences for the storeage of an article so dangerous as petroleum was considered to be was to give such a notice as would elicit the views of the parties residing in the immediate neighbourhood of the stores for which the licences were sought. In that way, all the next-door neighbours of the storekeeper would have full knowledge of the application being made; and they would be made expressly to understand that the main object of giving them the notice was to afford them the amplest opportunity of showing the grounds upon which they might consider that they ought not to have their lives and properties endangered by the storeage of such a dangerous substance in their vicinity. At the same time it would be necessary, notwithstanding any objections which might be advanced, that the superintending architect should view the premises for which the licence was required, and that the plans of them should be obtained, and be open for the inspection of the neighbouring owners and occupiers. With these general views, he submitted the motion with great confidence.

Mr. H. L. TAYLOR said, the objection to the adoption of the report would be, that, although the neighbouring owners and occupiers might have sufficient notice of the application for the storeage of petroleum, the public generally would remain in ignorance on the subject. And yet it was most important that the public should be made acquainted with the nature of such applications. He thought it desirable that, if notice were given to the neighbouring owners and occupiers, a similar notice should be communicated to the police. If it were true, as undoubtedly it was, that the police made a report of all fires, then it would seem to follow as a matter of policy and wise precaution that they should be put in possession of the fact that an application for a licence to store petroleum in a certain locality had been made to the Metropolitan Board.

Mr. NEWTON said it certainly seemed to have been the intention of the framers of the Petroleum Act that the vestries of the several parishes should receive notice of the applications for storeage licences; and yet that important provision appeared to have altogether escaped the notice of the Streets Committee at the time they drew up their report.

Deputy HARRISON expressed his dissent from the recommendation, upon the ground that it was not sufficiently general in its scope and operation. There was no doubt, from the provisions of the Petroleum Act, that all parties likely to be affected either in life or property by the storeage of an article so explosive and dangerous, should know of the application for licences having been made. What was the meaning of such a provision in the Act? and, if the provision were there, how best could it be carried out? The Streets Committee were anxious to make it a little more definitive, and to give the necessary notice to the public. The board were equally anxious on the same point. Should that notice be confined to the immediate owners and occupiers only? and for how long a time should it be given? Now, according to another Act of Parliament, that regulating the granting of licences to public-houses, it was required that the parties in the neighbourhood should have twenty-one clear days notice of the application having been made. Moreover, a printed form of application was necessary in such a case, and that form was posted. If a similar plan were pursued under the circumstances of the present case, then all doubt and difficulty would be removed, and future dissatisfaction on that score would be prevented. He thought that this would be a far more satisfactory course to adopt than the one recommended by the committee. He was unwilling to act with such seeming discourtesy towards the committee as to move an amendment; but he confessed he should like to see them offer to take back their recommendation, which appeared to him to be an unintelligible mode of accomplishing the desired object, in order to consider whether they could not hereafter report in favour of the course he had ventured to suggest.

Mr. FREEMAN observed that the committee were not departing from the well-known principle of the board. On the contrary, they were merely proposing to act with reference to these applications for petroleum licences as the board had always acted with regard to the matter of projections—namely, to attach the necessary public notice to some particular part of such of the adjoining buildings as were likely to be affected.

Mr. CRELLIN said, the number of persons likely to be endangered by the storeage of petroleum would not be very great in several cases. In others, no doubt, there would be a great variety of buildings in the neighbourhood of petroleum stores. In all cases, however, whether the danger was imminent to great or small, the committee had thought it the best and wisest course to pursue that the notices should be given by their own officer, in the belief that by that means every interested person would be made fully and early acquainted with the fact that the application for the storeage had been made. There was no desire on the part of the committee that there should be any concealment. On the contrary, they were firmly persuaded that they had taken special care, according to the terms set forth in their recommendation, that all the parties should know of the application.

Mr. SAMUDA was of opinion, notwithstanding all which had been said in support of the recommendation, that the matter ought to be referred back to the committee, in order that all the necessary measures might be adopted, not with the view merely of preventing serious damage to the owners and occupiers of adjoining premises, but of guarding against injury to others residing at a greater distance. He apprehended that the notice which the committee had recommended to be given, extended only to within the limits of the neighbourhood of the petroleum stores.

The CHAIRMAN said, the notices would be served upon all those parties who were likely to be injured in the event of an explosion.

Mr. SAMUDA observed that there was an ambiguity about the wording of the recommendation, which required some ampler explanation than the committee had afforded. In his opinion, it was not the immediate neighbours only who should be served with the notice, but others also who were beyond the neighbourhood, and those also who were interested in parochial government.

The CHAIRMAN reminded the honourable member that the motion before the board was, that the report be adopted. If the report were adopted, then the terms in which it was couched would of necessity be approved.

Mr. SAMUDA said, he was quite aware of the motion before the board. He would again suggest that the recommendation be referred back to the committee, and for this among other reasons: that he wished such a plan to be proposed by the committee as would have the effect of acquiring such an amount of knowledge from the neighbourhood at large as might assist the board materially in their mode of procedure with reference to the storeage of this dangerous substance. The storeage of petroleum might have a very serious influence on many others, besides those immediately connected therewith. For instance, it might have the effect of raising the insurances upon the persons occupying premises in the neighbourhood. It would be very desirable if, in all cases, when an application for a licence for the storeage of the article came before the board, it was accompanied with this additional information upon the part of the persons making that application, that they had ascertained from the neighbours adjoining their property that the application, if granted, would not preclude those neighbours from getting insured, or cause their rates of insurance to be increased; but, he was afraid that the recommendation of the committee, in its present ambiguous shape, would not be attended with this desirable result. He considered that this was a point well worthy of consideration, more particularly when he remembered that the board had felt themselves under the disagreeable necessity last week of refusing licences to the Asphaltum Company and Mr. Timothy, partly because of the want of information upon this matter. If, indeed, they found that the rate of insurance would be raised upon the neighbours by reason of the storeage of the article, then their judgment would be influenced, and their decision expedited. He confessed he could not discover, unless some very valid reasons should be put forward to the contrary, why the board should not obtain all the information which it was possible to procure where there were so many interests at stake.

Mr. LEGG coincided in opinion with the last speaker, that the subject ought to be referred back to the committee.

Deputy HARRISON confessed that he did not understand the meaning of the word "adjacent" in the recommendation. It was, to say the least, an ambiguous phrase, inasmuch as it did not define the distance to which the notice was to extend. He had before merely suggested, but he would now take upon himself to move, as an amendment—"That so much of the report of the committee as was contained in the recommendation be referred back for reconsideration;" and he hoped that, in reconsidering it, the points he had suggested would not be overlooked.

Mr. LEGG seconded the amendment. He thought that, if they were to serve notice of the application on one party, they ought to serve it on all those resident within fifty yards round the proposed petroleum stores.

Mr. COLLINSON was of a similar opinion, because those at the distance of fifty yards were likely to sympathize with those whose premises were more in proximity to the danger of an explosion.

Mr. DERMER submitted that the most direct and proper course to pursue would be to give the necessary notice to the local boards of each district, because they were acquainted with the localities and circumstances of their respective neighbourhoods. At the same time, he would by no means limit the giving of the notice to those boards; he would also issue it among all the owners of the property situated in the vicinity of the petroleum stores.

Alderman LAWRENCE supported the recommendation of the committee. He said the committee had very carefully considered the matter, and that the only question with them was, whether the notice to the parties living adjacent to the petroleum stores should emanate from that board, or from the local authorities? It was considered that time would most probably be lost if the duty of issuing the notices were assigned to the local authorities, because these bodies were very seldom in the habit of assembling. It was understood that the superintending architect of this board would send the notices, not only to the parties residing in the neighbourhood of the petroleum stores, but to the local authorities also, in order that the fullest publicity might be given to the fact of the application. Therefore, rather than send the recommendation back to the committee, he should be happy to move at once that the notice should be sent to the local boards as well as to those owners and occupiers of the property adjacent to the petroleum stores. It had been said that these adjacent owners and occupiers consisted of a large number of persons. But this was a mistake. He believed that, in some instances, there could not be more than some two or three owners, and even if they were in all cases as numerous as had been stated, it would be impossible to describe a certain circle around the petroleum stores; but, perhaps the notice to the local boards would obviate every difficulty.

The CHAIRMAN said the difficulty which had weighed with the committee with regard to sending the notices from the local boards was this: that these boards, in some instances, did not meet oftener than once in three or four weeks. It had been suggested in the committee that the notice should be sent to the vestry.

After a few words from Mr. LE BRETON and Mr. PHILLIPS,

Mr. RICHARDSON observed that the words of the recommendation were limited to the giving of the notice to the "occupiers" only. He was anxious to inquire whether notice to the occupiers only would be sufficient? Supposing the petroleum premises were surrounded by land, not occupied for any particular purposes, then, he thought that the owner of that land ought to have notice, also. He was in favour of making the notice as general as possible, in order that all parties might have fair warning of the nature of the application.

Mr. PHILLIPS, in the course of his reply, said he was somewhat amused at the variety of suggestions which had been made in the course of this discussion. But the speakers seemed to ignore the fact that all these suggestions were old, and that they had been considered carefully by the committee. After having been so considered, the committee had drawn up their recommendation in the most general manner possible. The plain meaning of that recommendation was that the superintending architect, in the exercise of his discretion, might send the notice to the local authorities, and also to the police-station; and, in addition to these means of publicity, post it up throughout the neighbourhood of the applicant's premises. At all events, if this were not expressed in so many words on the face of the recommendation, the committee intended it to have such an effect, after a very long discussion of the whole of the circumstances of the case. Knowing that the local authorities did not meet in some instances except once in a month, it was deemed unwise to assign to them a duty which always required great promptness in its execution; and, therefore, the committee had adopted a more direct means of giving the notice. It was true that this recommendation did not say in what exact form the notice should be given; but the superintending architect was, nevertheless, given full power and authority in the matter; and was empowered to do the best he could, in all cases. If the recommendation were adopted, and carried out according to the terms in which it had been drawn up, there would not be any mistake committed; but, if the matter were referred back to the committee, for them to consider afresh as to whom the notices should be sent, the board might get themselves into a difficulty from which they would be unable to extricate themselves; and they might, moreover, find that they were rendering the carrying out of this particular provision of the Act still more perplexing than even it was when it passed the Legislature.

Mr. WILKINSON said, it appeared tolerably clear from the observations made during this discussion, that there was by no means that understanding upon the part of the members of the committee with regard to the recommendation which the last speaker had stated as being the case. Mr. Phillips had informed them that the committee had intended the recommendation to have a certain effect, but there was no proof that such an intention existed on their parts, judging from the remarks they made; and, therefore, he was in favour of referring the matter back for further consideration. It appeared to be the opinion of Deputy Harrison that the party applying for the licence should give the notice to his neighbours; but he (Mr. Wilkinson) should very much like to be informed whether that party was bound by the Act to give any such notice.

Mr. H. L. TAYLOR thought the report ought to be referred back to the committee, with instructions to them to take into consideration all the points which had been raised during the course of this debate.

The question was then put, and, by a large majority, the amendment in favour of referring back the report to the committee for further consideration was carried.

The SUPERINTENDING ARCHITECT read the following report upon the application of Messrs. Humfrey, Yool, and Co. for a licence under the Petroleum Act for a tank and shed at their oil and candle-works, situated at Suffolk Grove, Suffolk Street, Southwark:—

This is a renewed application for a licence under the Act, in respect of the above-mentioned premises, where petroleum is to be kept and manufactured.

A brick tank sunk 2 feet below the level of a yard at one side of the premises is proposed to be constructed, and is to be covered with a light corrugated iron roof, supported by iron columns, and the two adjacent walls of ample height. The sides not enclosed by brick walls, will be enclosed with an iron network with 1¼ inch meshes. The quantity of petroleum to be kept will, it is stated, be 50 casks at 30 gallons each, equal to 1500 gallons, and, each cask being equal to 6 gallons, an additional 300 gallons are provided for, making in all 1800 gallons; but, by calculating the contents of the tank, and deducting 6 inches from the depth to provide against an overflow, I do not find that it will contain more than 1680 gallons, or (allowing for the displacement of the casks), 46 casks at 30 gallons each. Therefore, any approval or licence must limit the quantity to what can be safely contained in the tank.

It must be remembered that there are three stills for manufacturing in the same yard, and no provision is suggested for keeping them out of contact with the crude oil in the tank. This should be provided for in some way that may be satisfactory to the board, and the tank constructed and the general premises made secure to my satisfaction, before the board entertain the propriety of granting a licence. This I recommend should be intimated to the applicants.

Mr. CRELLIN said, he had reason to believe that Messrs. Humfrey and Yool had intimated their willingness to make the alteration suggested in the report of the superintending architect, and, therefore, he wished the consideration of granting the licence to be postponed until it was seen whether the alterations would be made.

Mr. NEWTON said, he also had been given to understand that the parties were willing to comply with the requirements of the superintendent architect. All the board had now to do was, to refuse the licence, and to inform the applicants that they might renew the application, when the premises were put into a satisfactory state.

The present application was thereupon rejected.

FRIDAY, OCT. 31.

The CLERK read the following report from the Streets Committee:—

Your committee have to report, that, in pursuance of the resolution of the board of Friday last (No. 5), they have reconsidered their report with reference to giving notices to occupiers of adjacent property in the case of applications for licences under the Petroleum Act, and have directed their attention to the various suggestions made by members of the board during the discussion of the subject at the meeting on Friday last; and, having carefully considered the question, they recommend—"That fourteen days previously to the consideration by the board of any application for a licence under the Petroleum Act, notice of such application be affixed by the officers of the board to the premises in respect of which the licence shall be applied for; and a copy thereof also forwarded to the vestry or district board within whose jurisdiction the premises shall be situate."

Mr. PHILLIPS said that on two former occasions the committee had made reports, in one of which they recommended the requisite notices to be served on the owners and occupiers of premises adjoining those for which the licence was applied. It was at first supposed that such a notice would be amply sufficient to cover all the requirements of the Act, and to ensure the utmost publicity. The committee had not then directed their attention to a consideration of the whole of the matters which the serving of these notices involved; but, when the subject came before the board on Friday last, several members threw out a variety of suggestions, the whole of

which had since been taken into consideration by the committee; and the result was that the present recommendation was submitted. He believed that this recommendation would be quite sufficient to meet every case which could by possibility occur. It had, however, been suggested to him that there was room still for an amendment being made in it, in order to guard against the possibility of an owner or occupier of the premises applying for a licence preventing, or conniving at the prevention of the notice from becoming publicly known; and, with that view, he would propose that the following words be inserted in the recommendation:—"The applicant being responsible for the notice remaining where placed."

The CHAIRMAN said, a question might arise here of some importance, namely, whether the board had power to direct its officers to place a bill or notice upon the door of the owner or occupier's premises without obtaining permission from him so to do. It was true that the board might say they would withhold the licence if the notice were not posted, but then it must be recollected that the owner or occupier had the power of appeal in case of such a refusal. He should himself be sorry to see the officers of the board posting the notices without their first asking the consent of the parties, neither did he think that the officers could be legally instructed to do anything of the kind. The posting, to be done properly and legally, must be done with the consent of the owner.

Mr. PHILLIPS said, he was quite aware of the point raised by the chairman. The difficulty in the present case was greatly increased by the provisions of the Act of Parliament, because that Act did not point out the manner in which publicity to the application for the licence was to be given. If, however, the notice were affixed by the officers to the premises of the applicant, and a copy of the same forwarded to the vestry or district board, within whose jurisdiction the premises should be situate, and if the applicant were made responsible for the notice remaining where placed, then the whole of the inhabitants of the district would have a clear intimation given them that the application had been made. The committee were of opinion that, perhaps, the notice on the applicant's premises would be more prominently seen than any of the other notices. Of course, if the board were of opinion that the clause he now proposed to add to the recommendation should not be embodied in it, he would bow at once to their decision. Still, he could not but think that the applicant ought to be made responsible for the notices being left where placed. It might be that the board had no legal power to direct their officers to post the notices on the applicant's premises, but he apprehended that with his (the applicant's) consent, there could be no question of that kind raised.

Mr. FEW said, the proper course to pursue under the circumstances, was to take the opinion of their legal adviser upon the point.

Mr. PHILLIPS submitted that, as the board had to deal with a very difficult Act of Parliament, and that as they had a very heavy responsibility thrown upon their shoulders by reason of its provisions, it was their duty to take every means in their power to remove that responsibility from themselves. They should adopt some such course as the committee had now recommended—and, if possible, with the addition he had suggested, in order to guard against any increase of that responsibility. At present, they had a very delicate and important duty to discharge, in discussing the application of the owner or occupier, and then of determining whether or not the licence should be granted. But there were other difficulties created by the terms of the Act; and, unless these were surmounted in a proper and satisfactory manner, their responsibilities would be increased tenfold. In the committee, where the whole of these matters had been discussed calmly and dispassionately, such recommendations had from time to time been made as, it was believed, would remove a very large amount of responsibility from the board. The present recommendation, for instance, would enable all the parties materially interested to object, if they should so think proper, to the granting of the licence. The board had already determined by a vote that every applicant's case should stand upon its own merits, and that no general rule could be laid which should determine whether applicants should have licences granted to them. The present recommendation would be found of valuable assistance in the right direction; and, therefore, he moved its adoption, together with the addition he had already read. But, if he must adhere to moving the precise words of the recommendation, he would willingly do so, hoping that some other gentleman would afterwards move the additional words.

Mr. COLLINSON seconded the motion. If the applicants did not comply with the requisitions of the the board, then, of course, it would be in the power of himself and his brother members to refuse the granting of the licence.

In reply to Mr. RICHARDSON,

Mr. SMITH said he had no difficulty in answering the legal question. It would be a trespass to post the notices on the premises without the permission of the owner or occupier. He thought the officers should be authorized to put up the notices, after having asked and obtained the consent of the parties. To do so otherwise would be to act illegally.

Deputy HARRISON moved—"That the suggestion now made by the solicitor be inserted in the recommendation, namely, that these words be added, 'With the consent of the applicant.'" This addition would serve to inform every applicant for a licence that the board were only making a reasonable request, and such a request, made, as it would be on the part of the public, would doubtless be complied with without a murmur. There could be no doubt whatever, he thought, when put in such a form, it would be immediately complied with. He coincided in the view of some of his friends near him in thinking that, in the event of the notice being removed from the front of the premises, the applicant should be also requested to make the board acquainted with the circumstance, in order that a fresh notice might be posted. Of course, the applicant, after having complied with the first request, would not himself remove the notice, but others might, and, in such a case, the applicant should be asked to hold himself responsible for making an immediate communication to the board to that effect. Then, if any one should tear down the original notice, a second could speedily be posted: all difficulties would thus be avoided, and all fair and reasonable publicity would be given to the neighbourhood. He moved that—"These two additions be made to the recommendation."

Mr. SAVAGE seconded the adoption of the additions.

Mr. H. L. TAYLOR said the responsibility upon the part of the applicant of keeping the notice on his premises might be made a condition of the granting of the licence.

Mr. ROBINSON asked the solicitor, whether the board, under the Act of Parliament, had any right to compel parties who were applying for these petroleum licences to comply with certain propositions which the board might make, but which were not in the Act?

Mr. SMITH replied, that if parties came forward and asked for a licence for their premises, the board had a right to say to them—"There are certain regulations which we must request you to comply with."

After a few words from Mr. HALL, the question was put, and agreed to as follows:—"That, fourteen days previously to the consideration by the board of any application for a licence under the Petroleum Act, notice of such application be affixed by the officers of the board to the premises in respect of which the licence shall be applied for with the consent of the applicant, who is to be responsible for the notice remaining where placed, and a copy thereof also forwarded to the vestry or district board within whose jurisdiction the premises shall be situate."

The CLERK read a report from the Streets Committee relative to an application from Mr. Alfred Geere for a licence under the Petroleum Act, which recommended that, inasmuch as the arrangements of the premises were not described in the application, it should not be assented to.

Mr. PHILLIPS said, the committee had found it impossible to advise the granting of the licence in this case. If the parties, however, acted upon the suggestion contained in that document, they might come before the board again upon a fresh application.

The motion was agreed to, and the licence refused.

The CLERK read a report from the Streets Committee respecting an application from Messrs. Stuart and Co. for a licence to keep for sale at their premises, No. 15, George Street, Blackfriars Road, a small quantity of the products of petroleum—namely, mineral turpentine and paraffin oil—which stated that the arrangements of the premises were described in such general terms that they could not recommend the board to assent to the application.

The motion was agreed to, and licence refused.

The SUPERINTENDING ARCHITECT read the following report relative to an application from Messrs. Hilton and Ryder, of Great Suffolk Street, Southwark, for a licence for a tank:—

This application is for a licence to keep one of the products of petroleum, known as benzole or naphtha, at the above-named premises.

The plan shows in block their extent and dimensions. They are brick-built, with slated and tiled roofs, and abut eastward and southward upon other business premises, in other occupations—westward upon Montague Street, and northward upon Great Suffolk Street. The premises facing the latter street are two stories high above-ground; the rear and larger portions only one story, without a ceiling floor, lofty and airy, and the whole paved with stone.

The quantity of spirit proposed to be kept for sale is 400 gallons, to be emptied from casks into a wrought-iron cistern of 4 feet cube, with a 15-inch main-hole, with screw-cover, which will be kept closed when the cistern is full. The premises are used generally as an oil-warehouse, and it is said that no one sleeps there.

The cistern is proposed to be placed at the south-west angle of the premises, next to those of Messrs. Carter and Shelly, tallow-melters, which are separated from those of Messrs. Hilton and Co. by a party-wall, which has several large openings in it above the roofs of Messrs. Hilton, and would, therefore, under any circumstances, be dangerous if a fire were to occur in either. Moreover, the lowness of the parapets between Messrs. Hilton's premises and those on the east are not well calculated to check fire.

I am of opinion that a safer place might be selected for the cistern, and that a small sunk tank, as suggested in other instances, should be formed under the cistern, to catch the contents, and to prevent it running into the adjoining street, and into the drains on the premises.

I understand that Messrs. Hilton will adopt any reasonable plan to meet the wishes of the board; but a licence should be withheld under present circumstances, or until a sunk tank be constructed in some part of the premises to be approved by the board.

Upon the motion of Mr. COLLINSON, this report was adopted.

EXTRACT FROM THE ANNUAL REPORT OF THE METROPOLITAN BOARD OF WORKS.

GAS ACTS.

In the report of the year 1861, it was stated that difficulties had arisen as to the parties entitled to receive the amount of the costs and charges incidental to the passing of the Metropolis Gas Act, 1860. One of the accounts sent in was by a parliamentary agent, for the sum of £3666. 0s. 4d., which was reduced on taxation to £3033. 18s. 10d., and for the payment of which amount he applied to the board. It appeared, however, that, in the course of the proceedings, a sum of £1413 had been paid by certain district boards, and notices were given by some parties that the board should not part with this sum; and, under the advice of counsel, the board determined to withhold payment of the sum claimed by the agent, until he should produce a proper authority.

After some correspondence, the agent brought an action against the board, to enforce the payment of his claim.

The board were advised to raise the question by demurrer, and the Court of Common Pleas decided that the agent was not the party who could enforce the demand.

The action has not further proceeded; but the agent is, it is believed, taking steps to bring about some satisfactory adjustment of the claim.

The Royal Assent having been given, on the 6th of August, 1861, to the bill for transferring to this board the powers, so far as regards the metropolis—exclusive of the City of London, which the former Act conferred on justices of the peace—in relation to the sale, &c., of gas, the board proceeded to put the Act into operation. This was found to involve many very important considerations, such as the division of the area of their jurisdiction into districts; the selection of persons practically as well as theoretically acquainted with the construction of meters; the selection of localities, adapted to the wants of the metropolis, for the erection of permanent gas-meter testing-houses; and other arrangements necessary to the efficient working of the measure. As the matter admitted of no delay, it became necessary to erect a temporary meter testing-house on each side of the river Thames; and, accordingly, a galvanized iron building was constructed on ground in the possession of the board which had been cleared for the Covent Garden approach, and another on ground similarly situated with respect to the Southwark and Westminster communication. For the eastern division of the metropolis, a site has been purchased in White Lion Street, Spitalfields, of the Commissioners of Her Majesty's Works, &c., for the sum of £1194. 13s. 4d., and a contract has been entered into for a permanent building at a cost of £1367.

The board have also entered into a contract for the erection of a permanent testing-house for the southern district of the metropolis, on land belonging to the board, in Castle Street, Southwark, at a cost of £1598.

A third permanent site has been decided upon for the western portion of the metropolis, in Great Smith Street, Westminster, and the board are now negotiating for a lease of the premises.

From the commencement of the operations of the board under the Act in question, on the 4th of November last, up to the end of June in the present year, the total number of meters tested by their officers was 17,135, and the amount of fees received in respect of the same, £563. 9s.

ON WEBSTER'S METHOD OF PREPARING OXYGEN GAS FROM A MIXTURE OF NITRATE OF SODA AND OXIDE OF ZINC.

By JOHN HENRY PEPPER, Esq., F.C.S., A. Inst. C. E.,
Professor of Chemistry, and Hon. Director of the Polytechnic Institution.

[From the *Chemical News*.]

The statement, that large quanties of oxygen gas could be quickly and easily procured from a mixture of one part, by weight, of nitrate of soda, and two parts of crude oxide of zinc, obtained from the (so-called) galvanizing zinc-pots or baths of Birmingham and other places, appeared so doubtful, that, prior to the introduction of the new process at the Polytechnic, I was induced to visit Mr. Webster and his co-patentee, Mr. John H. Porter, at Bent's Wharf, Cannon Row, Westminster, in order to investigate practically the working of this new mode of making oxygen gas.

The apparatus arranged for the manufacture of oxygen and other products consists of a circular, portable, iron, fire-brick lined surface, containing an inner strong cast-iron vessel, 10 inches in diameter, furnished with a cover and iron tube; into this is placed a second cylindrical iron pot or retort of 7 inches diameter, open at the top, and provided with an orifice at the base, temporarily stopped with a piece of sheet iron, so that, when the materials used are exhausted, the inner pot can be removed, and the contents easily knocked out with an iron bar; and, as the product left after the disengagement of the gas is not allowed to fuse, and only becomes slightly coherent or pasty, this cylindrical form of retort, open top and bottom, and placed in an outer vessel of iron, which can be properly closed by a luted cover, answers remarkably well, and may be used by any intelligent workman. In connexion with the outer iron vessel is a 1½-inch iron pipe, luted into a stoneware tube, forming part of, and leading to the bottom of, a 30-gallon stoneware vessel, containing half a gallon of water (5 lbs.), and eight moveable, stoneware, colander-like shelves; upon these are placed 48 lbs. of residue, which have been taken out of the retort after a former experiment—*i. e.*, when the oxygen has been obtained from it. This residue, or *caput mortuum*, consisting (as will be noticed more particularly in another part of this paper) of oxide of zinc, caustic soda, nitrite and nitrate of soda, &c., is moistened with half a gallon of water, and carefully placed on the shelves, which are fitted in one after the other, commencing at the bottom of the vessel. The purifier, thus arranged, is furnished with a lid dropping into a water-joint, and the whole connected with a sheet-iron gasometer, painted inside and out, and having a sectional area of 28·2744 feet, making the cubical contents per vertical inch 2·3562 c. i.

As the success of the process, so far as the maximum of oxygen is concerned, depends greatly on the thorough dryness of the materials used, 12 lbs. of nitrate of soda were dried on a hot plate forming the top of the circular iron furnace, and 24 lbs. of oxide of zinc were made red hot in the retort; the loss of weight by this method of drying was very slight, and did not exceed an ounce or so in either case.

Ten pounds of the dry and warm nitrate of soda, and 20 lbs. of the dry and warm oxide of zinc, were then roughly mixed together in an iron tray, and dropped through an iron funnel into the inner red-hot retort, which could be easily lifted in or out of the exterior one by means of a chain and little crane attached to the furnace.

The cover, provided with a hole at the top, was then luted on with a mixture of Stourbridge clay and sand, and in about a minute or so the nitrate of soda gave off oxygen, coloured with the orange-red fumes of nitrous acid; the top aperture was now closed, and the connexion with the purifier and gasometer opened at 1·30 p.m.

The following columns show the rate at which the gas was made, although it is right to state that the gas comes over frequently much faster:—

Time.	Vertical Inches, equal to 2·3562 Cubic Feet.
1.30	
1.35	1·50
1.40	1·90
1.50	2·30
2.00	3·00
2.10	4·30
2.30	6·75
2.40	8·50
2.50	9·75
3.00	11·00
3.10	12·00
3.20	13·00
3.30	13·30
3.45	14·00
4.00	14·30

2·3562 × 14 vertical inches = 32·968 cubic feet.

Directly the gas ceased to come over, the valve in connexion with the gasometer was turned off, and the inner retort, being lifted out with the contents (the residue, or *caput mortuum* already mentioned), and weighed, was found to have lost 5·5 lbs. After knocking out the residue, the retort was again quickly charged, at 4 h. 5 m. p.m., with a fresh mixture of 10 lbs. nitrate of soda and 20 lbs. of oxide of zinc, which gave off the whole of the gas by 6 h. 30 m. p.m.

The gas amounted to 14·3 vertical inches—

14·3 × 2·3562 = 33·69 cubic feet,

and the loss of weight of the materials used was again found to be 5·5 lbs. The residue in the purifier, having now been used for these two charges, was taken out, and it weighed 2 lbs. heavier than before, in consequence of its having absorbed nitric acid. The residue was then digested with the whole of the weak nitric acid which had been absorbed by the half gallon of water placed at the bottom of the purifier (the whole weight of the acid being about 11 lbs.), and when perfectly dried and warm it weighed 48 lbs. It was then placed in the retort, and lost 4 lbs., producing (according to Mr. Webster, who watched the operation to the end) 28 cubic feet of gas—thus showing that when 50 lbs. of refuse material out of the retort are used to purify the gas from 20 lbs. of nitrate of soda, the nitric acid obtained during the process is retained, partly by the solid substance, and partly by the water in the purifier, and that, if the whole is then mixed, digested, dried, and subsequently heated in the retort, it will give out almost as much gas (28 cubic feet) as 10 lbs. of fresh nitrate of soda (33 cubic feet).

The 50 lbs. of residue were procured after heating a mixture of 20 lbs. of nitrate of soda and 40 lbs. crude oxide of zinc; so that the quantity of gas obtained by this plan from 20 lbs. of nitrate of soda, and using the nitric acid, amounts to :—

	Cubic feet.
1st charge of 10 lbs. nitrate of soda and 20 lbs. of crude oxide of zinc	32·986
2nd ditto, ditto	33·69
3rd. Material out of purifier, after being used to absorb the nitric acid produced from Nos. 1 and 2	28·00
Total cubic feet	94·676

Theoretically, and supposing the 20 lbs. of nitrate of soda were chemically pure, and decomposed into oxygen and nitrogen, leaving a residue of soda, the loss should be 12·82 lbs.; the loss was, however, 5·5 × 2 = 11 lbs. The nitrate of soda used was the ordinary commercial article, and contains 2½ per cent. of chloride of sodium.

The gas obtained from the nitrate of soda and oxide of zinc was analyzed by the phosphorus method, and also by the usual hydrogen mixture fired by the electric spark in Ure's syphon eudiometer, and gave, as the mean of several experiments, 59 volumes per cent. of oxygen gas, and 41 volumes per cent. of nitrogen.

94·676 cubic feet of gas, therefore, contain—

	lbs.	oz.
55·858 cubic feet of oxygen* =	4	11
38·818 cubic feet of nitrogen =	2	13
Nitric acid and loss	3	18
	11	0

The nitric acid appears to be formed during the first stage of the process, when the materials thrown into the red-hot retort are comparatively cold, and evolve nitrous acid, NO_3, and oxygen; these gases, in the presence of the moisture of the purifier, form nitric acid, and it is very likely, that when a second and smaller red-hot iron vessel, containing oxide of zinc, or, still better, oxide of copper, is connected with the first iron retort, any acid produced during the process would be decomposed perfectly by the second red-hot surface, and, even if nitrate of zinc or copper were formed, it would be ultimately decomposed into nitrogen, oxygen, and oxide of copper. The experiment again, twice repeated, afforded nearly the same results:—

Experiments.	Nitrate of soda.	Oxide of zinc.	Loss.	Cubic feet of gas.
No. 1	10 lbs.	20 lbs.	5·25	37
No. 2	10 „	20 „	5·25	32
2	20 lbs.	40 lbs.	105	69

In order to ascertain how often the same 20 lbs. of oxide of zinc could be used with separate additions of 10 lb. charges of nitrate of soda, three experiments were tried, as tabulated below, it being understood that the second 10 lbs. was not added till the first had evolved its gas, and so on with the third 10 lbs.:—

Nitrate of Soda.	Oxide of Zinc.	Residue.	Loss.	Gas. Cubic Feet.	Nitric Acid in Solid Contents of Purifier, 56 lbs.	Nitric Acid absorbed by Water in Purifier.
10	20	25·5	4·5	49·47	2 lbs.	3 lbs. + water 5; total, 8 lbs. Sp. gr., 1·136.
10	—	30·0	5·5	47·12	increase in	
10	—	36·25	3·75	47·12	weight.	
30	20	36·25	13·75	143·71	2 lbs.	8 lbs. Sp. gr., 1·136

These experiments were performed between 1 p.m. and 10 p.m., and it is evident that there is a great increase of gas, and a reduced proportion of nitric acid. It may be noticed, as a proof of the rapidity with which oxygen is prepared by this process, that, with a small apparatus only capable of containing the three charges above mentioned, it produced 143·71 cubic feet of gas (containing 59 per cent. of oxygen) in nine hours or nearly 16 cubic feet per hour.

If the apparatus had been large enough to contain more materials, there is no doubt that the same 20 lbs. of oxide of zinc would have done with one or two more separate 10 lb. charges of nitrate of soda.

The oxide of zinc probably acts mechanically (like oxide of manganese with chlorate of potash), and also chemically, as a carrier of nitric acid. When the nitrate of soda is heated, it gives off nitric acid, which is probably taken up by the oxide of zinc, and again decomposed (as the temperature rises) into oxygen and nitrogen; and, as before stated, if a second small red-hot vessel, containing oxide of copper or zinc, was attached to the retort, the whole of the nitric acid would probably be decomposed, and an increased proportion of oxygen obtained.

In order to form some notion of the value of the gas as a means of increasing artificial light, a peculiar shaped Bude light burner, consuming coal-gas instead of oil, was experimented with.

The burner, with oxygen admitted to the centre of the flame, consumed, according to an experimental meter, made by Brown and Bischoff, 4·2 cubic feet of coal-gas, and 5·3 cubic feet of the oxygen gas per hour, and produced a light equal to 36·7 Parliamentary candles, consuming 120 grains per hour.

The same quantity of coal-gas per hour, burned in a 36-hole argand burner, with a chimney 9½ inches high, gave a light equal to 10·1 candles.

The light obtained from the coal-gas and oxygen was exceedingly bright and white, both gas and candle-light looking yellow by the side of it.

The cost of the coal-gas alone, to produce the same light, would be about equal to that of the extra oxygen used; but the purity of the light, and the saving of gas-burners and fittings, by using oxygen and coal-gas, increase the value of the combined arrangement.

To ascertain the composition of the residuum, weighing 36 lbs. 4 oz. (left in the retort after the three experiments, in which the same oxide of zinc was used three times), it was digested with plenty of water, and the insoluble oxide of zinc separated by a calico filter, and this, when washed and dried, weighed 23 lbs. 12 oz.

	Grains.
* Weight of a cubic foot of oxygen, at a temperature of 60°, barometer 30 inches	590·8
Weight of a cubic foot of nitrogen, at same temperature and pressure	517·7

The filtrate and washings, evaporated to dryness in an iron vessel weighed 15 lbs. 4 oz., and a portion of this analyzed gave the following results:—

Insoluble matter, nearly all oxide of zinc	4·20
Oxide of zinc soluble in the soda	4·40
Water	15·00
Soda	37·00
Chloride of sodium	5·54
Nitrite of soda	5·15
Nitrate of soda	28·31
Loss	·40
	100·00

The 36 lbs. 4 oz., would, therefore, contain, according to this analysis (stating it in round numbers, and omitting fractions):—

	lbs.	oz.
23 lbs. 12 oz. of oxide of zinc and alkali, less 10 oz. water	23	2
15 lbs. 4 oz., consisting of—	lbs.	oz.
Oxide of zinc	1	5
Soda	5	10½
Water	2	4
Chloride of sodium	0	13
Nitrite of soda	0	12½
Nitrate of soda	4	5
Loss	0	2
	15	4
Less water	2	4
	13	0 = 13 0
Loss	2	0
	36	4
13 lbs. 12 oz. gaseous matter lost by the 30 nitrate of soda, consisted of 143·71 cubic feet of gas, containing—		
83·36 cubic feet of oxygen gas	7	0½
60·36 „ nitrogen gas	4	7
10 lbs. nitric acid, sp. gr. 1·136, containing 19·128 per cent. dry acid (Ure's table)	1	14½
Loss*	0	6
	50	0

With respect to the cost of the oxygen gas prepared by Webster's process, it may be stated that, taking the commercial price of nitrate of soda to be £14. 10s. per ton, and the crude oxide of zinc at £2 per ton, the value of 30 lbs. of nitrate of soda would be about 3s. 10d., and that of the 20 lbs. oxide of zinc, 4d., making a total of 4s. 2d.; and the following table exhibits the probable value of the products:—

Materials. Cost of Materials.	Products. Gas.	Soda.	Nitrate of Soda.	Nitric Acid.	Oxide of Zinc.
30 lbs. nitrate of soda, at 3s. 10d.	143·71 cubic feet, containing 83·36 of oxygen.	5 lbs. at 2d. per lb. †	4 lbs. at 1½d. per lb. †	10 lbs. containing 2 lbs. stronger, at 6d. per lb.	20 lbs. at 4d.
20 lbs. oxide of zinc at 0s. 4d.					
50 lbs. . . 4s. 2d.	1s. 6d.	10d.	6d.	1s.	4d.

On comparing the cost of this method with those of other sources of oxygen gas, it will be noticed that Webster's is the cheapest known process, if the products can all be realized. M. Deville calculates the cost of oxygen, obtained from various substances, as follows:—

		Fr.	s.	d.
One cubic mètre (equal to 35·317 cubic feet):				
„	from chlorate of potash	10·00 =	8	4
„	oxide of manganese	4·87 =	4	0¾
„	sulphuric acid	1·00 =	0	10
„	nitrate of soda, ox. zinc		0	7½ 6/10
„	do., rejecting all products		1	9 7/10

The cheapness of Webster's process is so satisfactory that it will probably be used at the Polytechnic, provided that the nitrogen mixed with the oxygen does not materially interfere with the brilliancy of the lime-light.

ADDITIONAL REPORT ON THE ABOVE PROCESS, BY WILLIAM CROOKES.

By the kindness of the proprietors of the patent, I have been afforded an opportunity of critically examining every stage of the above process; and am, therefore, enabled, from personal observation and experiment, to endorse all the facts given by Mr. J. H. Pepper, in this report. The gas is produced from materials of but trifling value, in large quantity, and by an operation requiring no skilled superintendence whatever. At first sight, it would seem that the proportion of nitrogen present with the oxygen would tend to render the gas of only slight commercial value. A little consideration will, however, show that this is not necessarily the case. Although pure oxygen is invaluable in the laboratory, and at the lecture-table, its employment in an undiluted form would be impracticable in ordinary metallurgical operations on a large scale as the intensity of its action would very soon rise to such a degree of violence as to reduce flux, fuel, metal, and furnace, into one chaotic liquid mass. It is, indeed, very doubtful whether the mixed gas, which is obtained in such abundance under this patent, is not as strong as could be employed in most manufacturing operations without serious damage to the furnaces and crucibles used. The only case in which it is likely a purer gas would be required is in the metallurgy of the more refractory platinum metals. The intensity of the "lime-light" produced with this mixture is necessarily inferior to that obtained with pure oxygen; but it is abundantly sufficient for all ordinary purposes of illumination, and far better than could be anticipated from the composition of the gas. Indeed, it is only by comparing the two lights simultaneously, side by side, that the difference of intensity becomes apparent.

* Probably not really a loss, but represented in the 2 lbs. of nitric acid absorbed by the solid matter in purifier, which is, no doubt, of a higher quality than that absorbed by the 5 lbs. of water in the same purifier, and equal to 8 lbs., sp. gr. 1·136.

† A chemical manufacturer would separate, by crystallization, the greater part of the nitrite, nitrates, and chloride of sodium, from the caustic soda.

ON THE MANUFACTURE OF ALCOHOL FROM COAL-GAS.

By M. A. MALLET.

[From the *Journal de l'Eclairage au Gaz.*]

Thénard said, in his "Treatise on Chemistry," in 1827—"It is certain that the greater portion of vegetable substances are composed only of hydrogen, carbon, and oxygen; but, nevertheless, we cannot form any of those substances from these elements. This powerlessness of chemistry has often rendered results doubtful in the eyes of persons unacquainted with science, although really profound thinkers. J. J. Rousseau, when following the course of chemistry with Rouelle, said that he would only believe in the analysis of flour when he saw chemists able to reproduce it. The great writer would, doubtless, in the present day, use different language." These reflections of Thénard's are very judicious. Rousseau would certainly have had his conviction disturbed if he had witnessed the beautiful experiments of Lavoisier and of Meunier in 1783 and 1785, as well as the more recent ones of Lefevre-Gineau, Fourcroy, Vauquelin, and Seguin, on the synthesis of water. The philosopher of Geneva would, most probably, have believed in chemical analysis, after seeing 500 grammes of water produced by means of oxygen and hydrogen, in the proportions indicated by the analysis.

But, what would Rousseau, and even Thénard, have said, if they had been fortunate enough to see alcohol manufactured from these elements? This production is one of the wonders of the chemistry of the present day, which is not yet at the end of its marvellous developments. The attention of chemists and manufacturers has, therefore, been awakened during the last two months, because it is now proposed to transplant this industry from the laboratory into the manufactory.

Since the question of the artificial manufacture of alcohol has seriously occupied attention, it has been discovered that, as early as 1854, a M. Castex, of Puteaux, took out a patent for a means of obtaining alcohol from *the smoke of oil, fat, and of all other organic matter*. The following is an extract from the patent given in the "*Cosmos*":—"In burning these organic matters, the smoke which is liberated may be absorbed by concentrated sulphuric acid. This sulphuric acid mixed with water and distilled, produces alcohol. To facilitate the absorption of the smoke, it is caused to pass through a body impregnated with sulphuric acid, or through coke moistened with the acid. When the acid no longer absorbs smoke, the body impregnated with it may be washed for the purpose of extracting it; and this weakened acid gives alcohol on distillation. Before delivering the ordinary lighting gas for the purpose of being consumed, it may be treated by this method."

The specification of the patent is drawn up in such singular terms, that it is clear M. Castex's knowledge of chemistry is not very extensive. As to making use of lighting gas before its consumption for the production of alcohol, it is a perfect impossibility. The gas would no longer give any light; and we do not recommend gas companies to make any use of the idea broached by M. Castex, for the consumers would soon rise in arms against the application of such a process.

The patent was taken out by M. Castex on the 8th of December, 1854; and, on the 15th of January, 1855—that is to say, little more than a month afterwards—M. Bertholet explained for the first time to the *Académie des Sciences* his mode of producing alcohol synthetically. The nearness of these two dates may give rise to some reflections, from which we abstain, because we have not now to examine the question of the validity of the patent. For the scientific world, M. Bertholet is the first author of the discovery; and the silence of M. Castex is a mode of acquiescence which has some importance.

Let us now speak of the experiments of our celebrated chemist. It is not with smoke that M. Bertholet produced alcohol, but from the bicarburetted hydrogen, or olefiant gas. He introduced into a flask 36 litres of this gas, a quantity of concentrated sulphuric acid, and 3 kilogrammes of mercury—the use of which in the operation is, we apprehend, for the purpose of minutely dividing the particles. He then agitated the whole together for a considerable length of time. After about 53,000 agitations, it was found that the whole of the gas had been absorbed by the acid, and that a real combination was formed, producing an acid to which the name of *sulphovinic* or *sulphoethylic* was given.

In treating this acid with water, a new reaction was produced. The bicarburetted hydrogen set at liberty combined in its nascent state with water, forming alcohol, leaving the sulphuric acid combined with the addition of a certain quantity of water—that is to say, diluted—and, according to the formula of equivalents, we have $C_4 H_4 + 2 H O = C_4 H_6 O_2$. The alcohol produced is expelled from the liquid by heat.

Up to the present time, M. Bertholet has made no attempt practically to utilize this curious experiment. Possibly, he was frightened by the difficulty which attended the absorption of carburetted hydrogen by even the most concentrated sulphuric acid; and he has contented himself with sending to the International Exhibition of London a litre of alcohol thus produced from its elements, which may be seen in the glass case of M. Ménier, No. 204, Class II. of the French department.*

What M. Bertholet has not attempted, M. Cotelle, of St. Quentin, has since realized. Like M. Castex, he has had the idea of employing coal-gas for the production of alcohol, but not before using it for the purpose of giving light. Coal-gas well purified contains light carburetted hydrogen, bicarburetted hydrogen, carbonic oxide, hydrogen, and certain carburets, more or less well determined—such, for example, as a trace of propylene, aniline, and even perhaps of acetylene. Of these various gases or vapours, the bicarburetted hydrogen is, with propylene, the sole useful element for the purpose proposed. Unfortunately, it exists only in very small proportions. The richness of coal-gas in bicarburetted hydrogen depends evidently, in the first instance, on the nature of the coal distilled, and afterwards upon the manner in which it is distilled. If certain old and not very numerous analyses are to be relied upon, the proportion of bicarburetted hydrogen may be from 8 to 12 per cent.; but, under the conditions in which the manufacture now takes place, we consider these figures as much too high, and believe that 3 or 4 per cent. at the utmost would be much nearer the truth. We speak of the gas manufactured in retorts from the coals of Belgium and the north of France. As to the gas manufactured in coke-ovens, we do not believe it has yet been

* The bottle stood in a corner near the top, on the left hand, and might have been easily overlooked.—ED. J. G. L.

analyzed. However this may be, the following is the method which M. Cotelle appears to have adopted.

After having indicated in his patent many means which he has probably tried, he condenses the gas, and purifies it completely from its sulphuretted hydrogen and ammonia, and finally passes it through concentrated sulphuric acid, which dehydrates it as much as possible. By means of a pump or exhauster, the gas is directed to the base of an earthenware or glass column, filled with plates or diaphragms, pierced with small holes, upon which the sulphuric acid, at 66°, descends, and which is, consequently, minutely divided. The column which M. Cotelle used when we witnessed the operation, had only 14 plates or diaphragms, and a single passage of the acid did not suffice to absorb all the bicarburetted hydrogen of the gas, and, at the same time, to saturate all the acid. According to the inventor, a cascade of six plates would be required to accomplish these two objects at one operation—the absorption of all the bicarburetted hydrogen, and the saturation of the sulphuric acid.

Let us suppose this desideratum obtained. The carburetted hydrogen and the propylene are absorbed in the column, and there remains from 96 to 97 per cent. of light carburetted hydrogen, hydrogen, and oxide of carbon, without value for the purpose of giving light, but capable of being used for the purpose of heating. It is principally with the object of so using them that the pump or exhauster is required, so that the gas may be drawn off or propelled in any direction without increasing the pressure upon the retorts.

The sulpho-vinic, or sulpho-ethylic acid, which M. Cotelle calls his *vinasse*, is treated with five times its volume of water, and the mixture is then submitted to the action of a current of steam, which carries with it the alcohol produced. These vapours are condensed, and the acoholic liquor is obtained. This is distilled on a little lime to saturate the sulphuric acid which has been carried with it, and the products of this distillation are rectified, and alcohol of 90° is obtained.

The sulphuric acid, which has been diluted by the operation so as to reduce it to 20° or 25° of strength, must be concentrated to 66° if required to be used over again, or some other use must be found for it in its diluted state. This use of it, advantageously if it is possible, involves the establishment of another factory on a large scale, even for a distiller producing 30 hectolitres (660 gallons) per day; for the quantity of sulphuric acid at 66° to be employed is considerable. It amounts to about 1500 kilogrammes (30 cwt.) of acid for each hectolitre (22 gallons) of alcohol produced, or 45,000 gallons (45 tons) of acid for 30 hectolitres (660 gallons) of alcohol. Should it be desired to concentrate the diluted acid, apparatus must be provided, such as is used in the sulphuric acid factories. This truly is not a manufacturing impossibility; but what will be the cost of concentrating for 1500 kilogrammes of acid—that is to say, for one hectolitre of alcohol?

This expense of concentration appears to us, in the actual state of chemical industry, to be a grave difficulty in the way of the success of the new process, even when the complete absorption of the bicarburetted hydrogen is easily effected, as well as the simultaneous saturation of the sulphuric acid, and we are quite sure that it would be necessary to make a new estimate of the cost price which the journals of St. Quentin with laudable zeal, but with too much precipitation, had fixed at 25 francs per hectolitre of alcohol of 90°. Any serious estimate of the cost price must have been premature, as M. Cotelle was not provided with suitable apparatus to determine it.

Twenty-five francs per hectolitre for alcohol of good taste (it is said to be exempt from all empyreumatic flavour) the selling price of which was 70 francs! Here was enough to set all the speculators in a ferment, and to cause serious reflections to all distillers, and even the manufacturers of sugar and agriculturists. Purchasers presented themselves from all quarters, anxious to treat with M. Cotelle for his patents, French as well as foreign, on condition, be it well understood, that he satisfied them, on the subject of cost price. The French patent was sold, it is said, for £20,000, and the English one for £480,000. A company was formed at St. Quentin, with a capital of £16,000, which was subscribed in an hour, for the purpose of constructing a real manufactory, and solving the problem on a manufacturing scale. Since then, that is to say about two months ago, the enthusiasm has abated, the matter has been examined with more *sang froid*, and it is generally admitted that the cost price can only be ascertained as the result of a manufacture on a practical scale, and not by approximative experiments in the laboratory.

Some persons have not been sparing in their criticism of the process, and even of the inventor, and have gone so far as to pretend that M. Cotelle had imposed upon the public; that he had never made alcohol from coal-gas, and that the brandy, which he had given his visitors to taste, was manufactured from molasses. Till, however, we have proof to the contrary, we cannot believe that M. Cotelle has lent himself to such charlatanism. For all actions, there is logically a motive. What can have been the motive of this inventor? The illusion could not last long, and all his future prospects must be irreparably destroyed, should he have lent himself to any such fraud. M. Cotelle must, therefore, be regarded as acting in good faith, and even should it be proved that he has grosaly deceived himself as to the cost price of his alcohol, or as to the possibility of introducing this system of manufacture, he is entitled to our praises for the trouble he has given himself, and for the sacrifices he has imposed upon himself, and his co-partners, if he has any. Pioneers often fail in their task, but they render incontestable services to society.

The following ideas, upon the most advantageous conditions in which the manufacture of alcohol can be effected, and upon the chances more or less brilliant which this new process has of success, may not be without interest.

Sulphuric acid, even concentrated to 66°, absorbs bicarburetted hydrogen with difficulty. This is indisputable; but in this process the gas is not used in a pure state, as in coal-gas (and even in gas produced from cannel, schist, and Boghead) it exists in a very small proportion, so that it is in a state of great subdivision, and, consequently, more easily subject to the action of the sulphuric acid. If the process is applicable, it is clear that gas will not be expressly manufactured for it even from cannel or from Boghead. In some manufactures, these gases are to be obtained as a species of waste product. Thus, in coke-ovens, immense quantities are suffered to be lost; and certainly the manufacturers of metallurgic coke will not hesitate to adopt such furnaces as will allow the gas and, at the same time, the other sub-products to be collected, if a market can be found for them even at a low price. There are some coals, such, for instance, as those of Commentry, certain varieties of St. Etienne, and of Mons, which may produce coke of a tolerably good quality, and a certain proportion of bicarburetted hydrogen. It is to such coals that a preference would be given. Generally, also, the manufacturers of oils of schist, who distil either Boghead or the schists of Autun or of the Allier, derive little profit from the gas which they produce in spite of themselves, and this gas is much richer than the ordinary coal-gas in bicarburetted hydrogen. These are the sources to which, in our opinion, the manufacturers of alcohol by the new process should, in the first instance, look for their materials.

This use of gas, the refuse product of coke and schist oil manufactories, is all the more to be sought for as the quantity of coal to distil, with special reference to the manufacture of alcohol, may be very considerable. The cost of production published in the papers of St. Quentin indicates a consumption of two tons of coal for the manufacture of a hectolitre of alcohol; but, as we have before said, the quantity of coal to be employed depends evidently upon the richness of the gas given by it on distillation in bicarburetted hydrogen. If the gas contains 12 per cent. of bicarburetted hydrogen (we leave aside the propylene), two tons may suffice for the production of a hectolitre of alcohol at 90°, if the whole of the carburetted hydrogen is properly employed. We submit that 1765 cubic feet of this gas are necessary for the production of this quantity of alcohol (M. Cotelle only reckons upon 353 cubic feet). Supposing the gas produced from coke-ovens at the rate of 7063 cubic feet per ton of coal (and this product is the maximum, in the present state of such apparatus), the quantity of coal necessary for the production of a hectolitre of alcohol will be as given in the following table:—

Richness of Gas in Carburetted Hydrogen.	Volume of Gas in Cubic Feet.	Coal distilled in Pounds.
12 per cent.	14,692	4,588
11 ,,	16,104	5,020
10 ,,	17,658	5,525
9 ,,	19,601	5,682
8 ,,	22,073	6,890
7 ,,	25,216	7,871
6 ,,	29,419	9,186
5 ,,	35,317	11,025
4 ,,	44,146	13,781
3 ,,	58,838	18,374
2 ,,	88,292	27,562
1 ,,	176,585	55,125

The quantity of coal being given by the formula $x \times 7063 \times a = 50$, a representing the quantity of bicarburetted hydrogen contained in the gas.

The gas produced in schist-oil manufactories which distil Russel's Boghead No. 1, contains from 12 to 14 per cent. of bicarburetted hydrogen; and its richness should, therefore, be four times greater than that of the coal-gas manufactured in retorts.

The price of the raw material of the alcohol will depend, therefore, essentially on the price at which the manufacturers of coke will sell either the cubic mètre of gas or the cubic mètre of carburetted hydrogen; for they may easily sell only the part useful for the manufacture of alcohol—the surplus of the gas serving for the ordinary consumption of the ovens. These are our opinions upon the most advantageous manner of obtaining the raw material.

We will not return to the difficulty which the absorption of the bicarburetted hydrogen by sulphuric acid presents; but it may be useful to go further into the question of the expense of concentrating acid of 22° into acid of 66°. The large manufacturers of sulphuric acid admit that the concentration to 66° of the chamber acid, which weighs 52° or 53°, costs them at least a franc per 220 pounds of acid at 66°. To this expense it is necessary to add the cost of concentration from 22° to 52°. What will it be? As this operation is not carried on in ordinary manufactories of sulphuric acid, we can only give an approximate estimate; we, therefore, prefer to abstain. For a daily manufacture of 660 gallons of alcohol, 99,225 pounds of sulphuric acid of 66° are required. The concentration of this acid, diluted to 22°, with the loss consequent on it would be an operation of extreme importance. Besides the cost of concentration, some account must be kept of the loss in acid caused by the distillation of the alcohol from the *vinasse* by means of steam, which necessarily carries with it a certain quantity of acid; and also causes some expense in the manipulation of this acid. Since M. Cotelle's experiments have been under consideration, we have always thought and still think that the question of the acid is one of the great difficulties and perhaps the greatest in the way of the successful realization of the new process.

Another consideration, but of another class, must not be omitted. The manufacture of alcohol with bicarburetted hydrogen gas, upon a certain scale, would necessarily be followed by a fall in the price of alcohol, and, consequently, a reduction in the price of molasses, which would lead to a diminution in the cost of manufacture. Besides this, well-informed persons pretend that the Champonnois system applied in farm-houses to the distillation of beet-root, and the utilization of the refuse on the spot, will allow alcohol of 90° to be produced at a cost of 1s. 8d. per gallon, profit included.

It will be seen that the question is complex, and it may be dangerous to form any positive opinion, at the present day, upon the new process. It is wise, therefore, to wait the practical experiments which the company Cotelle are about to make at the pit's mouth in the use of the gas from coke-ovens. Parties interested will, nevertheless, do well not to fall asleep in their quietude. The alarm is given; numerous inventors are about to, or do already, occupy themselves with the question which will be closely examined under all its phases, and M. Cotelle should not be the last to seek actively to improve his process. The word "impossible" has long since ceased to exist in France in all that relates to industry, and the production of alcohol, by means of gas, may, one day or another, take its place among our manufacturing pursuits. This would be one of those wonders to which modern chemistry has accustomed us.

ON THE COMPOSITION OF ANILINE REDS.

By M. E. Kopp.

[From the *Répertoire de Chimie.*]

M. Hofmann's remarkable work, precise, perspicacious and original, like all the researches of this chemist, has completely modified all the opinions before admitted on the nature of aniline reds.

Before the publication of M. Hofmann's memoir, too much attention was given to the analogies which were supposed to exist necessarily between the colouring matter of carthame and aniline red: all phenomena were interpreted with a view to these analogies.

Carthamine acts as a colouring matter only when free and disengaged from all combination. As a hydrate, it has a beautiful red-carmine colour; dry, it presents the metallic reflections of cantharides or murexide.

Though not, strictly speaking, an acid, it will combine with alkalies. These combinations, soluble in water, are colourless, and carthamates possess no dyeing quality. To make this tinctorial property reappear, it is sufficient to saturate the alkali with an acid, and in this state at the moment of disengagement from its alkaline combination carthamine dyes most easily. Thus it was admitted that the pure free red, presenting when dry green metallic reflections, which constitute the colouring matter, and which dissolved in pure water is again precipitated from it by the addition of neutral alkaline salts.

It has been established that aniline red acts principally as a base, and that it will combine with acids. But these combinations were considered unstable

and decomposable by water alone, which, removing the acid, sets the red at liberty with all its tinctorial properties.

Thus was explained the decoloration of a cloth dyed with aniline red by printing it with an energetic acid, such as hydrochloric, nitric acid, &c. Where the acid and red came in contact a combination took place, which, being almost colourless, produced white or yellowish tints. But, on washing the cloth in plenty of water, the red or rose tint reappeared, because the water took away the acid, and with it, in fact, a certain quantity of red, yet leaving sufficient on the cloth to reproduce the characteristic rose colour.

On the other hand, it was generally admitted that aniline red would also combine with bases, forming colourless combinations (fuchsates) possessing no dyeing properties; but that the addition of an acid, however weak, would destroy this combination, setting the red at liberty with all its dyeing properties.

These views seemed to be corroborated by the phenomena presented by a cloth coloured by aniline red, a white spot forming immediately on the application of ammonia or any other alkali. But little by little, especially after the application of ammonia, the red colour reappears in proportion as the ammonia disengages itself. The reappearance of the colour was naturally attributed to the gradual decomposition of the fuchsate of ammonia,—a combination supposed to be so unstable as to lose its ammonia spontaneously in the air, leaving the aniline red free and coloured on the cloth.

Hofmann's researches have modified and rectified most of these explanations. They show, in fact:—

1. That what was considered as free aniline red, fuchsine, azaleine, Depouilly's red, &c., was in reality a salt of rosaniline, more or less pure, and capable of containing free rosaniline, for they are salts which dried have the green metallic appearance of cantharides wings, and which dissolved in water or alcohol, yield the beautiful crimson colour which has made aniline reds so celebrated.

2. That there are more acid salts of rosaniline, which are precipitated from their watery solution when neutral alkaline salts are dissolved in it.

But from this fact flows the important inference that this precipitate may be accompanied by double decompositions. Thus, in dissolving in pure water acetate or nitrate of rosaniline, a coloured precipitate is obtained by dissolving chloride of sodium in the solution.

But this precipitate will not be pure acetate or nitrate of rosaniline. It will contain more or less rosanilic chloride, if this latter salt is less soluble than acetate or nitrate.

This is, in fact, what takes place.

We have boiled MM. Lauth and Depouilly's pure red (obtained by precipitating the boiling solution of rough red prepared by nitric acid by means of sea salt) with a slight excess of milk of lime. The filtered liquid was perfectly colourless. It was evaporated in a water bath. (During evaporation, rose-coloured circles were deposited on the sides of the capsule, yellowish flakes at the bottom of the liquid, which in two experiments took a beautiful azure colour.)

In the salt of lime forming the residuum from the evaporation, the presence of notable quantities of hydrochloric acid was easily detectable.

It is now very easy to explain the results obtained by M. Bolley. In precipitating rough fuchsine (prepared by bichloride of tin and aniline) by means of sea salt, the precipitate contained chlorine, but no oxygen. In precipitating the same fuchsine by saltpetre, the precipitate contained both chlorine and oxygen.

By dissolving chlorated fuchsine in diluted sulphuric acid, heating for several hours, saturating with pure carbonate of soda, and precipitating by saltpetre, a precipitate is obtained containing no chlorine.

In the first case, the precipitate consisted only of chloride of rosaniline In the second, of a mixture of rosanilic chloride, and nitrate. In the third, all the hydrochloric acid having been expelled by the sulphuric acid, the precipitate contained no chloride, but very probably a mixture of more or less pure rosanilic nitrate, and sulphate, and, perhaps, (on account of the saturation by carbonate of soda) a certain proportion of free rosaniline.

3. By the action of energetic acids on aniline reds, triacid salts of rosaniline are formed, which, being yellow, efface the coloration of the tissues. The triacid salts being unstable are decomposed by water, which withdraws two equivalents of acid, and regenerates the monacid salt,—that is to say, the rose-red colouring matter.

Again, in this case the red salt may have been modified by the acid used to dissolve it, so that, for instance, the acetate of rosaniline having been dissolved in hydrochloric acid, the water precipitates rosanilic chloride from the solution. It will also be understood that by dissolving nitrate of rosaniline in hydrochloric acid by heat, part of the colouring matter may be destroyed by the formation of *avua regia* and its action on rosaniline.

4. The most remarkable and important fact established by M. Hofmann is, that in making alkalies react on aniline reds, the disappearance of colour was due not to the combination of the alkalies with the red, but to the setting at liberty the base, which when pure is colourless.

The restoration of colour by acids is caused by the reconstitution of the salts of rosaniline.

We are of opinion that this extraordinary property of rosaniline (scarcely another instance of which is known), of being colourless when first set at liberty, but gradually taking a rose-tint, then deepening to reddish-rose, and finally to carmine-red, when exposed to the air,—and all this without undergoing alteration either in weight or composition,—is worthy of deep study.

To this phenomenon other phenomena are connected, the causes of which ought to be investigated. We will give an instance:—

Having dissolved some of Lauth and Depouilly's pure red in weak, tepid hydrochloric acid, we gradually poured it into a slight excess of boiling milk of lime. After ten minutes boiling, the precipitate was nearly white, and the supernatant solution quite colourless. Thinking to dissolve the slight excess of lime, we added chloride of ammonium to the boiling solution, to form chloride of calcium and free ammonia, which was disengaged by boiling. At the moment the ammoniacal chloride was added, the white precipitate became dark rose colour, the liquid remaining colourless.

Though M. Hofmann's admirable memoir has thrown great light on the history of aniline reds, and has explained away the errors previously published, many questions remain as yet unresolved.

It is perfectly intelligible that, having considered fuchsine, Depouilly's pure red, &c., as free colouring matters, we may regard fuchsine (chloride of rosaniline) as a chlorated body, and the nitrate as a nitrated compound.

To facilitate the comparison of previous analyses with M. Hofmann's, we will give the centismal composition of the hydrate, chloride and nitrate of rosaniline, and, among others, of nitrated rosaniline, a body as yet hypothetical:—

$$C_{40}H_{18}[NO_4]N_3=C_{40}H_{18}N_4O_4.$$

		C.	H.	N.	O.	C.
Hydrated rosaniline,	$C_{40}H_{21}N_3O_2$	75·23	6·58	13·16	5·03	—
Rosanilic chloride,	$C_{40}H_{20}N_3Cl$	71·11	5·92	12·44	—	10·53
Rosanilic nitrate,	$C_{40}H_{20}N_4O_6$	65·93	5·49	15·38	13·20	—
Nitrated rosaniline,	$C_{40}H_{19}N_4O_4$	69·35	5·20	16·18	9·26	—
Nitrated leucaniline,	$C_{40}H_{20}N_4O_4$	68·96	5·75	16·09	9·20	—

M. Hofmann having experimented with the products of M. Nicholson, who, in January, 1860, took out a provisional patent for the preparation of aniline red by arsenic acid, it is very probable that it is this red purified by a new process not yet made public, which has served as a base for the brilliant memoir of the celebrated English chemist.

Though it can hardly be doubted that the other methods of producing aniline red equally produce salt of rosaniline, it is, nevertheless, desirable that this should be proved experimentally. It would also be useful to know whether nitrated rosaniline is not formed by the action of nitric acid upon aniline.

We, likewise, think it best to advert to the absence, in M. Hofmann's memoir, of any description of nitrate of rosaniline and its properties.

It would be very interesting to know the nature of the easy transformation of acid salts of rosaniline into a particular aniline violet, under the influence of rough wood-spirit or aldehydes.

The examination and solution of all these questions are rendered much more desirable by the publication of M. Jaquelain's "*Etude des Matières Colorantes et Colorées, Extraites à l'état de pureté des Produits Commerciaux de l'Aniline*" (*Comptes-Rendus*, vol. liv. March 17, 1862, p. 612), which tends to establish a difference between the pure products arising from the processes of preparation.

M. Jaquelain has obtained:—

By arsenic acid from rough red, a crystallized red and violet.

By nitric acid from rough red, a crystallized red and violet.

From rough red, an uncrystallized red and a crystallized violet by mercurial nitrate.

From rough red, a crystallized red and violet by bichloride of tin.

He thinks he is able to assert that aniline treated by nitric, arsenic, and sulphuric acids, by bichlorides of carbon and tin, and by mercurial nitrate, gives rise to three principal compounds—namely, a red matter, a violet matter, and a resenoid matter of the colour of sepia, independently of the salts of aniline formed at the expense of the acids and even of the bases belonging to the agents employed, without prejudice to the co-existence of M. Hofmann's colourless bases, and that commercial products are mixtures in suitable proportions of these different bodies.

Physical and chemical characteristics, such as the solubility of these matters, appears to M. Jaquelain of a nature sufficiently decided to admit of his considering all these defined compounds as distinct, though having a certain analogy as colouring matters.

It is evidently essential to be certain that the differences observed between the crystallized reds obtained by M. Jaquelain are not caused by their being salts of different acids (arseniate, nitrate, chloride,) of the same base, which could hardly be anything but rosaniline and its derivatives.

The reactions and analysis of these compounds will easily decide this question.

ON THE SULPHUR COMPOUNDS IN PURIFIED COAL-GAS, AND ON CRYSTALLIZED HYDROSULPHOCARBONATE OF LIME.

By the Rev. W. R. Bowditch, F.C.S.

[From the *Transactions of the Royal Society.*]

The following facts relative to sulphur in what is called purified coal-gas, are additional to those already submitted to the Royal Society.

When I first made known the action of heated lime upon coal-gas, chemists accounted for the phenomena observed by two assumptions:—1. That the sulphur compound decomposed was free bisulphide of carbon. 2. That the decomposition was due to a reaction between water and bisulphide according to the following equation:—

$$CS_2+2HO=2HS+CO_2.$$

It was easy to show that these assumptions were erroneous, but exceedingly difficult to demonstrate the truth.

That the sulpur in gas does not usually exist as free bisulphide of carbon is proved thus:—

Gas which has been purified at the gas-works by lime, and which contains 20 or 30 grains of sulphur in 100 cubic feet, may be passed for a considerable time through a tube containing cold slaked lime without producing discolouration; but, if the same gas be charged with a minute quantity of bisulphide of carbon vapour and passed through the same lime-tube, the lime becomes yellow and green from the decomposition of the bisulphide of carbon.

If, instead of passing the gas through lime, it be passed through triethylphosphine, the beautiful red crystals which this base gives with bisulphide of carbon are not formed; but, if the base be dissolved in alcohol or ether, and the gas passed through this solution, the red crystals are formed, as Dr. Hofmann first proved. The alcohol or ether dissolves out the bisulphide of carbon from the hydrocarbon compounds of which it forms a part; and, when it is thus dissolved, it reacts with triethylphosphine.

Naphthalin, benzole, and other fluid hydrocarbons condensed from purified gas yield sulphide of hydrogen and other sulphuretted compounds by simple distillation, yet these do not produce the well-known red crystals with triethylphosphine. They may, moreover, be digested for weeks in an alkaline solution of oxide of lead without producing any sulphide of lead. Under similar treatment, bisulphide of carbon yields hydrosulphocarbonate and sulphide of lead in a few hours.

If the sulphuretted fluid hydrocarbons condensed from gas be mixed with ammoniacal alcohol and heated, and an alcoholic solution of acetate of lead be then added, a black precipitate is formed after some time, which evolves sulphide of hydrogen upon addition of an acid. In this case, neither hydrosulphocarbonate nor hydrosulphocyanide of ammonia is formed; yet it is well known that both are formed when bisulphide of carbon is added to ammoniacal alcohol. The erroneous view of the action of heated hydrate of lime upon the sulphur compounds in gas arose, I think, from the generally-received opinion that the blackening of lead salts by a gas is a proof that that gas is sulphide of hydrogen—joined to the fact that sulphide of hydrogen is one of the compounds produced by the action of the heated lime. If the sulphide of hydrogen had been separated from the mixture of gaseous compounds produced, the truth would have been apparent; but as, I believe, all experimenters have failed to separate them, the subject was obscure. After having failed in many processes devised by myself and suggested by others, I at last removed the sulphide of hydrogen, and showed that the blackening of lead salts is no proof of the presence of sulphide of hydrogen. Ordinary purified gas was passed over heated hydrate of lime, then through

a considerable quantity of well-washed hydrated peroxide of iron, over lead-paper, and subsequently through moist slaked lime. The peroxide of iron was slightly blackened, and withdrew every trace of sulphide of hydrogen: the lead-paper became black, and the slaked lime yellow. This yellow lime gave a primrose-coloured solution with water, which precipitated lead and silver salts brownish-red, thus showing the presence of impure hydrosulphocarbonate of lime.

To be certain of the absence of sulphide of hydrogen, some of the yellow lime was treated with hydrochloric acid, and the gases evolved thereby were conducted into a solution of potash. The potash solution gave no reaction with nitroprusside of sodium, showing the absence of sulphide of hydrogen, and when boiled with nitric acid gave no precipitate with a salt of baryta.

The hydrochloric solution of the lime contained a sulphur salt, which was obtained as sulphate of lime when nitric acid was added and the whole was boiled.

The blackening of the lead-paper in this case could not be due to sulphide of hydrogen, as that compound was absent. Nor, I think, is it due to the hydrosulphocarbonic acid which passed over, and in contact with, the lead-paper, and was arrested by the lime. The red compound which this acid produces with lead salts is said to turn black rapidly; and the red compound produced by a lead salt, and those of Berzelius and Zeise, undoubtedly does so blacken, as also does that produced by a salt of lead and an alkaline pentasulphide. I have, however, obtained a red lead salt by the reaction of crystallized hydrosulphocarbonate of lime and basic acetate of lead, which remains red after drying in the air at ordinary temperatures and exposure for weeks to the free atmosphere. I, therefore, conclude that the blackening of the lead-paper in the above case, was not due to hydrosulphocarbonic acid, but to some unknown or unsuspected compound.

In order to understand this matter fully, I commenced some investigations into the reactions of bisulphide of carbon with metallic oxides and other compounds, a portion of which I have now the pleasure of submitting.

Red Crystallized Lime-Salt.—Slaked lime and bisulphide of carbon are mixed in a close vessel, and allowed to stand for three or four days. The lime at first becomes of a pale primrose colour, which gradually deepens to a fine lemon yellow. Water added to the yellow lime gives a solution of a gold colour, which precipitates salts of lead and silver reddish-brown, and salts of mercury brown. These precipitates become black upon standing a short time. If the yellow solution be allowed to remain for a few days in contact with the lime, crystals are formed which will be very small, and so distributed through the lime as merely to give it a fine salmon colour.

This lime-salt is of a bright ruby colour, and by the following process it may be obtained in beautiful crystals. Freshly slaked lime is to be mixed with so much water that, when stirred, it will aggregate into small lumps about the size of peas. These lumps are dried upon a sand-bath till they are hard, and will bear handling without producing powder. The lumps (quite free from dust) are placed in tubes *not more than an inch in diameter*. When the lime is cold, bisulphide of carbon is poured upon it in sufficient quantity to saturate the lime, and leave a few drops in each tube. The tubes are corked, and allowed to stand for three or four days. Water is then poured in carefully, so as not to remove any powder from the lumps of lime, and the tubes are closed and allowed to stand as long as the crystals increase in size. To obtain the crystals, the mother-liquor is poured off, the mass of lime, &c., is dried at ordinary temperatures, and the crystals are picked out. For success it is absolutely necessary that the lime should be in lumps, the vessel in which the reaction takes place of small diameter, and that undecomposed bisulphide of carbon be present.

Crystals so prepared appear to be perfectly permanent; they do not undergo alteration from several weeks exposure to atmospheric changes. I have not yet obtained them free from adhering lime, as all acids which will dissolve the lime decompose the crystals. They are soluble in water, but cannot be recrystallized from their solution. All the solutions I have yet tried decomposed without crystallizing. Other processes have equally failed to furnish a salt which can be obtained dry and pure; and I am therefore unable at present to furnish reliable concurrent analyses which will establish its formula.

I have not ventured an explanation of the reaction, because I am not yet acquainted with the compounds produced and their relative proportion. To ascertain whether an explanation based upon a reaction between the elements of water and bisulphide of carbon was tenable, I caused caustic lime to be heated to whiteness in a platinum crucible for two hours, and cooled out of contact with air. When cold, this anhydrous lime was saturated with dry bisulphide of carbon; and, in a short time, the lime became of a greenish-yellow colour, showing the progress of a reaction between the dry lime and the bisulphide of carbon.

Some of the reactions of this salt are remarkable; and more than one will exhibit the liability to error from the use of any but the most perfectly crystalline, dry, and clean specimens. Baryta-water added in excess throws down from an aqueous solution of the *pure* salt an amorphous, red, insoluble precipitate quite as brilliant in colour as vermilion. If this be washed directly after precipitation, the colour is retained for a considerable period; but, if left in the mother-liquor, it soon darkens. The washed salt dries a brick-dust red.

If, instead of the perfectly pure lime-salt, a solution of the salmon-coloured compound, which is formed when the salt is prepared in large vessels and with powdery lime, be taken, a brownish-yellow crystalline double salt of baryta and lime is formed, which is very soluble in water.

Nitrate of baryta gives lemon-yellow crystals in a red-brown mother-liquor with solution of the salmon-coloured mass, but an amorphous dirty grey precipitate in a yellowish mother-liquor with solution of the pure salt.

As soon as a quantity of the latter can be prepared, I hope to isolate the acid.

Salts of the oxides of barium, magnesium, strontium, silver, zinc, manganese, and chromium have been prepared by the direct action of the bisulphide of carbon. Some of these differ considerably from the salts prepared by Berzelius by the action of the bisulphide of carbon upon the sulphides of the metals. The process which furnishes the lime-salt well crystallized will be tried with other compounds, and the results submitted to the Society.

A very offensive suffocating gas is evolved during the decomposition of bisulphide of carbon by lime, which is injurious, if not poisonous; and, having suffered severely from breathing this and other noxious compounds derived from the same source, I think it right to call attention to it. I have formed a gas of similar properties by passing bisulphide of carbon and hydrogen together through heated lime, and should not be surprised if it prove to be the long-sought simple sulphide of carbon.

Slightly ammoniacal alcohol breathed from a cloth appears to be the best restorative for the severe depression caused by respiring the offensive gases and vapours above named.

DR. J. NORTHCOTE VINEN'S REPORT ON THE GAS SUPPLIED BY THE SURREY CONSUMERS COMPANY:—

1862. Week ending.	Number of Observations.	Maximum Light. Candles.	Minimum Light. Candles.	Average Light. Candles.
Oct. 25	4	13·42	12·07	12·58
Nov. 1	4	13·55	12·01	12·80

The volume of hydrocarbons averaged 4·0 per cent.; carbonic acid averaged 0·75 per cent. No sulphuretted hydrogen could be detected. There was a decided evidence of ammonia on two occasions. The maximum pressure was 31-10ths of an inch; the minimum, 5-10ths.

PRICES OF GAS IN AUSTRALIA.—Sydney, 15s. per 1000 feet; Melbourne, 16s. per 1000 feet, and £14 per public lamp (two companies); Geelong, 20s. per 1000 feet, and £15 per public lamp; Ballarat, 30s. per 1000 feet; Sandhurst, 35s.; Castlemain, 40s.

ATHENS LIGHTED WITH GAS.—Gas lighting has at length established itself on the classic soil of Greece. Thanks to the enterprise of a French company, gas made its first appearance in Athens on the 1st ult., amidst the acclamations of the people, and under the eyes of the (ex)-Queen, who promenaded on horseback through the city to witness the illuminations. Other towns are stated to be about to follow the example of the capital in introducing gas.

GAS EXPLOSION AT WIGAN.—Two private houses at Wigan were blown into ruins on Thursday, by an explosion of gas. It was supposed that the gas had escaped from a pipe beneath the floor—not an unusual place of escape, but nothing was done to find out where the pipe leaked, though the smell of gas had warned the inmates some hours before the explosion. The neglect nearly cost the life of the tenant of one cottage, whilst the two cottages were very much injured.

FIRE-CLAY STOVES.—A correspondent of the *Times* inquires whether the various earthenware stoves in the International Exhibition are to be returned to their respective countries, or dispersed among our stove-makers? "They are all," he proceeds to remark, "I believe, solely intended for consuming wood as fuel, but I should think that English ingenuity would soon adapt them for our coal. I hold that all our ingenuity hitherto, in the matter of stoves, has been wasted. We possess the best material in the world—fire-clay; while we have confined ourselves to iron. We have been in the right direction, for, in some instances, we have lined them with fire-bricks—but we have stopped short. If the air is not to be over-dried, we must get rid of the metal casing altogether. On trial of the stoves at the Exhibition, it will be found that fuel is greatly economized by the smoke passing through various flues before it finally escapes into the chimney. Thus, the whole stove is thoroughly and equally heated, and earthenware retains its heat for a considerable time, while iron gets cold almost immediately that the fire is extinguished. I can conceive two kinds of fire-clay stoves being very generally useful in this country—one for the cottage, where the handful of coals now wasted in an open grate would diffuse a degree of warmth at present unknown to its inhabitants; while it might be contrived to boil, bake, and stew—thus giving the cottager the opportunity of making his little piece of meat go much further than when suspended by a string. Another kind of stove would be for the office, the hall, and even the parlour and bed-room—cased with ornamental tiles; in many instances, it would be priceless. Mr. Trollope, in his 'North America,' commiserates the parched appearance of the American ladies, and attributes it to their stoves; but he might travel from Helsingborg to Haparanda—nearly 10 degrees of latitude—and find no lack of rosy cheeks among the fair maids of Sweden. Nay, further, the statistician will find, on investigation, that the mortality among infants and the very young is less in Sweden and Norway than in England. This I am inclined to attribute to the superior warmth of the peasants houses of those countries to those inhabited by our agricultural labourers and mechanics."

DISASTROUS FIRE AT THE OIL-WELLS.—On the evening of Wednesday, Oct. 8, there occurred one of the most disastrous fires that has yet happened in the oil region. It would appear that about three o'clock a fire broke out on the Blood Farm, at its intersection with the Tarr Farm, in the tanks of Mr. H. O. Filkins. As to how the fire originated, there is considerable diversity of opinion. Without any prejudice, we merely think it must have caught from some of the numerous engines in the immediate vicinity of the Filkins' well. The space burned over embraces from 18 to 20 acres. Most of this was on the Blood Farm, in what was called Maple Grove. In this grove was the Filkin, Lloyd, and several other wells. Oil had been stored in this locality for the last three months, and, of course, a large quantity was on hand. Here, as well as above, the oil-tanks were standing close together, intermingled with engine-houses, offices, &c. On this territory were stored some 30,000 barrels of oil, in tanks and barrels, besides some ten wells, seven of which were flowing. To those who have never seen a fire from petroleum, we can give no adequate description of the scene presented to view. Some 150 tanks of oil were on fire in a short time. The flames went slowly but surely from one object to another. The fire leaped up the trees, forming the grove, to a distance of from 75 to 100 feet. All the men in the immediate vicinity were busy at work to assist in staying the fell work of destruction. The smoke rolled in thick volumes over the scene. Occasionally, the sun would break through the thick cloud of smoke, revealing a sight of terrific grandeur and beauty. Amidst this stifling smoke, heroic men worked as manfully against their dreadful foe as if they had been on the field of battle contending against the Southern Confederacy. In these few hours men enacted as daring deeds as were ever done on any battle-field. Men, noble, brave men, stood upon tanks of oil which have been deemed as dangerous as a powder magazine, and bravely battled against the flame, and were almost stifled by the smoke. All that human foresight and exertion could do was done. But it was all in vain. It is true that some houses, and the refineries of Messrs. Barrows and Scott and Battles and Co., were saved, but the remaining portion of the ground was burned over. About six o'clock the fire ceased raging, for the simple reason that there was little or nothing left to burn. The whole space before occupied by tanks, wells, engine-houses, offices, and dwellings was swept clean. Maple Grove, which we have often admired as one of the finest ornaments of Oil Creek, is no more. The charred and blackened trees will long remain a monument of this sad disaster. During the conflagration Oil Creek took fire, and presented a grand sight. By the united exertions of the people assembled, the fire was put out. From a hasty examination, we should think the loss will not fall short of $100,000. Some 25,000 or 30,000 barrels of oil were consumed, together with numerous engines, &c. The oil-men took their losses coolly, and were rebuilding their derricks amidst the smoking ruins. During the fire there were no explosions, thus clearly demonstrating that crude petroleum is non-explosive.—*Oil City Register, October* 9.

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1½ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.			Glasgow.			Newcastle			Wales.			Yorkshire, Derbyshire, and Staffordshire.		
	£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.	£.	s.	d.
Pig Iron, No. 1, G.M.B.	3	7	6	2	16	0	2	17	6	3	0	0	3	5	0
1½ and 2-inch Socket-pipes	7	0	0	6	0	0	6	5	0	6	10	0	6	15	0
2½ and 3-inch ditto	6	10	0	5	10	0	5	15	0	6	0	0	6	5	0
5 and 5-inch ditto	6	0	0	5	0	0	5	5	0	5	10	0	5	15	0
6 inches and upwards ditto	5	15	0	4	15	0	5	0	0	5	0	0	5	10	0
Retorts, 1st fusion, hot blast	5	10	0	4	10	0	4	15	0	5	0	0	5	5	0
Ditto, 2nd ditto, cold ditto	6	10	0	5	5	0	5	10	0	6	0	0	6	5	0
Tank-plates, ¼ thick and above	6	0	0	5	0	0	5	5	0	5	10	0	5	10	0

WROUGHT-IRON TUBING,

Subject to 40 per cent. Discount.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 feet—per foot	1 8	1 0	0 10	0 7	0 5	0 4½
Ditto ditto, from 6 inches to 18 inches—each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows (wrought iron)	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, ditto	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 9	0 8	0 6	0 5	0 4
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2-quart	15 0	11 0	13 6	13 0	12 0	—

COALS.—*Per Ton.*

Newcastle.—Unscreened.		*Scotch Cannel.*	
Whitwell Primrose	6s. 9d.	Boghead (at Leith)	45s. 0d.
Medomsley, Eighton Moor, and Burnhope	7 0	Kirkness, best	23 0
Pelaw	7 3	Capeldrae, 1st quality	20 0
New Pelton, Pearth, South Pelaw, Washington Hutton, and South Pearth	7 6	Ditto, 2nd ditto	12 6
Pelton	7 9	Lesmahago (at Glasgow)	25 0
Ramsay's Newcastle Cannel	16 0	Ditto (at Leith)	27 6
		Arniston	27 6
		Wemyss	20 0
		Knightswood	18 0
		Pirnie	14 0

FREIGHTS.

Coastwise—Newcastle.—Per Ton.		*Foreign.—Per Keel.*	
Chatham and Rochester	7s. to 7s. 3d.	Barcelona	£26 0s.
Cork	11 0	Bordeaux	£16. to 16 10
Dover and Folkestone	6 9	Boulogne and Calais	8 10
Dublin	11 3	Cadiz	14 10
Exeter Quay	9 6	Cronstadt	—
Ipswich	6 0	Copenhagen	£9. 10s. to 10 0
London (Pool)	7s. 3d. to 7 6	Genoa	23 0
Lowestoft and Yarmouth	5 0	Hamburg	£10. to 10 10
Lynn	—	Havre de Grace	10 15
Portsmouth and Southampton	8s. to 8 3	Leghorn	23 0
Plymouth	8s. 9d. to 9 3	Lisbon	18 10
Shoreham	7 9	Rotterdam	8 10
Whitstable	6 6	Stettin	10 10
Weymouth	8 6	Trieste and Venice	21 0

SUNDRIES.

Best Newcastle Fire-bricks—per 1000	£2. 10s. to	£2	15s. 0d.
Cliff's Fire-bricks (at Wortley)—per 1000		2	15 6
Ingham's ditto (at Wortley)—per 1000		2	15 0
Fire-clay Retorts—per foot run	5s. 6d. to	0	7 0
Tough Cake Copper—per ton		98	0 0
English Pig Lead—per ton		20	0 0
Welsh Bar Iron (in London)—per ton		6	10 0
Foreign Spelter—per ton		18	0 0
English Block Tin—per ton		119	0 0
Banca—per ton		119	0 0
Tarred Rope Yarn—per cwt.		1	6 0

Advertisements.

TWO MEDALS AWARDED

GEORGE GLOVER & CO.'S

PATENT DRY GAS-METERS,

STANDARD GASHOLDERS, AND TESTING APPARATUS.

The Sales of Gas Act has rendered a far higher degree of accuracy in Gas-Meters than that generally attained hitherto, indispensable.

This necessity Messrs. George Glover and Co., are prepared to meet, their PATENT DRY GAS-METER being made in accordance with the same high standard of accuracy, and the same conditions and principles as those adopted in the construction of the National Standard Gasholders.

The daily use of these standards at the Exchequer for eighteen months has fully justified the opinion expressed of them by the Astronomer-Royal, in his reports to the Lords Commissioners of Her Majesty's Treasury, as capable of "being applied to Gas Measures of every class, and Gas-Meters of every class, as accurate as it is possible for human skill to make them."

That opinion has been endorsed by the jury in Class X. of the International Exhibition (several of them being eminent in science and engineering), having awarded the fac-simile of the National Standard and the other Gas Apparatus. Messrs. George Glover and Co. exhibit there the only medal for instruments relating to gas measurement which has been awarded in the Class. The award is for "*ingenuity, completeness, and efficiency of apparatus for measuring gas, and for excellence of material and workmanship.*"

Messrs. George Glover and Co. have also had a medal awarded them in Class XXXI. for *the superior construction and workmanship of their Improved Dry Gas-Meter.*

Particulars and lists of prices forwarded on application.

RANELAGH WORKS, RANELAGH ROAD, PIMLICO, LONDON.

Offices: 22, PARLIAMENT STREET, WESTMINSTER; and 15, MARKET STREET, MANCHESTER.

INTERNATIONAL EXHIBITION,

Class XXXI., No. 6300; and Class X., No. 2291; and "Illustrated Catalogue."

W. J. HOLLANDS,
IRON MERCHANT,
31, BANKSIDE, LONDON, S.E.

Socket, Flange, Hot Water-pipes, and all Connexions; Retorts, Hydraulic Main, Lamp-Columns, &c.; and every description of Castings and Wrought-Iron-Work for Gas and Water-Works, Steam, and general purposes.

N.B.—All goods kept in stock, and supplied at manufacturers prices.

Superior Newcastle Cannel Coal, direct from the Collieries.

Estimates given, and orders by post punctually attended to the same day.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas Works and Water Works.

Warehouse in London for Cast-iron Pipes and Connections of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Office in London, Mr. E. M. PERKINS, 78, Lombard Street.

JOHN WALKER,
Manufacturer of Fire-Bricks, Chimney-Tops, Gas-Retorts, &c.

OAK FARM FIRE-CLAY AND BRICK WORKS.
KINGSWINFORD, NEAR DUDLEY.

N.B. A Quantity of Circular and D-Retorts always in Stock.

SAMUEL CUTLER, Gasholder
MAKER and CONTRACTOR

For Tanks, Roofs, Purifiers, Condensers, Erection and Alteration of Works and every description of GAS APPARATUS.

PROVIDENCE IRON WORKS,
MILL WALL, POPLAR. LONDON, E.
Main Laying and Gas-Works erected complete.

WEST and GREGSON, Gas-Meter
MANUFACTURERS, &c.
UNION STREET, OLDHAM.

Station and Experimental Meters, Gas Pressure Registers, Gauges, Experimental Gasholders, Governors, Slide-Valves, &c. &c.

W. and G. would respectfully call the attention of Gas Engineers and Managers to their Station-meters, having made and erected the largest in use at the present time, two of which may be seen at the Stockport and Liverpool Gas Works, on application to the respective Engineers.

GEORGE CUTLER & CO.,
GAS ENGINEERS, &c.,
London Gasholder and Boiler Works,
8, WHARF, WENLOCK ROAD, CITY ROAD, N.,
LONDON.

Rye, Nov. 12, 1860.

Dear Sirs,—I consider it incumbent on me to acquaint you that the alterations recently made on the Rye Gas-Works—viz., the addition of a NEWLY-IMPROVED WASHER, and other work for the Purification of Gas, executed by the experienced workmen under your able supervision—are perfectly satisfactory to the Company, and the Gas is now as pure as it can be made.

I am, dear Sirs, your obedient servant,
CHARLES THOMAS, Superintendent,
Rye Gas-Works.

Messrs. Cutler and Co.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the advertiser, 42, Parliament Street, WESTMINSTER. [Office of the JOURNAL OF GAS LIGHTING, &c.]

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire Bricks, and every description of Fire Clay Goods.

JOHN ROGERSON and CO.,
NEWCASTLE-ON-TYNE & MIDDLESBRO'-ON-TEES.

Wrought and Cast Iron Pipes, Cast-Iron Retorts, and all kinds of Foundry Work necessary for Gas-Works. Fire-Bricks and Clay Retorts. Gas Coals of every description. Pig, Bar, and Plate Iron.

LONDON HOUSE:
12, ROYAL EXCHANGE BUILDINGS.

HARRIS and PEARSON,
PROPRIETORS OF
BEST CLASS-HOUSE POT AND CRUCIBLE CLAY.
MANUFACTURERS OF
FIRE BRICKS, GAS RETORTS, &C.
AMBLECOTE FIRE CLAY AND BRICK WORKS,
STOURBRIDGE.
Late in the occupation of I. and W. King.
Originally J. Pidcock, Esq.

NB. A quantity of best Clay Retorts in stock, viz.—Circulars, 14 inches, 15 inches. 16 inches.
D's, 16×12, 15×14, 20×16, 16×18.

JAMES OAKES and CO.,
ALFRETON IRON WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20, WHARF ROAD,
CITY ROAD, LONDON,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.

N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.

CHARLES HORSLEY, Agent.

DUPLEX GOVERNOR, for Gas-EXHAUSTER ENGINES.
D. LANE'S PATENT.

This Governor combines great delicacy with remarkable certainty of action. A pressure of one-tenth of an inch of water, operating on a diaphragm of 3 inches diameter, is sufficient to work the Regulating-Valve of an Engine of any power.

TESTIMONIALS.

Borough Engineer's Office, Town Hall
Halifax, March 29, 1862.

Dear Sir,—I have much pleasure in bearing my testimony to the efficiency of your Duplex Governor for regulating the speed of Gas-Exhausters.

The Governor has been perfectly self-acting, and has never given us one moment's thought, trouble, or expense. The engine-man has only to weight the tappets to the required vacuum, and the pressure-register paper never shows a greater variation than three-tenths in the twenty-four hours.

I can very confidently recommend the adoption of it to engineers and managers of gas-works making 50 million feet a year and upwards.

I am, dear Sir, yours faithfully,
G. W. STEVENSON.

Denny Lane, Esq., Cork Gas-Works,
Ireland.

Gas-Works, Cork, April 4, 1862.

Dear Sir,—Having for some time past had in use three of your newly-invented Regulators for governing the speed of Steam-Engines in connexion with Gas-Exhausters, I am glad that I am able to speak of this valuable machine in terms of the highest praise. I have had them applied, as you know, to high-pressure and condensing engines, with Beale's and also Anderson's Exhausters. In every case, this small and valuable instrument is thoroughly effective in regulating the speed of the Exhauster. No amount of care with the hand can equal its accuracy of action for the intended purpose.

Denny Lane, Esq. A. H. STILL, C.E.

An Illustrated Circular, explaining the operation of the Governor, can be obtained by application to D. LANE, 72, South Mall, CORK; and the Governor can be seen in London at the Offices of GEO. ANDERSON, Esq., C.E., 16, Adam Street, ADELPHI.

LESLIE'S PATENTS: Gas and Coke from common Coal, greatly increased in value.—60, Conduit Street, LONDON, W.

LESLIE'S PATENTS: Up to Forty Candle Gas.—60, Conduit Street, LONDON, W.

LESLIE'S PATENTS: Licenses for England, Scotland, and Ireland, the 86 Departments of France and Belgium.—60, Conduit Street, LONDON, W.

LESLIE'S PATENTS: The National Waste Heaps at Collieries UTILIZED for Gas purposes.—60, Conduit Street, LONDON, W.

WILLIAM RICHARDSON & SON, Gas and Hydraulic Engineers, and General Ironfounders; Steam-Boiler and Gasholder Manufacturers.

Offices and Stores—41, Meriden Street, BIRMINGHAM.
Works—Tunnel Foundry, DUDLEY.

READY and MEYNELL,
BILSTON STREET WORKS,
WOLVERHAMPTON.

Manufacturers of Gas-Fittings of every description, Lamps and Chandeliers, Star and Sun-Lights, and Mediæval and other Church-Fittings to any design.

GEORGE BOWER,
GAS ENGINEER, MANUFACTURER,
AND CONTRACTOR,
ST. NEOT'S, HUNTS.

References to between 100 and 200 Gas-Works Designed and Erected by the Advertiser.

JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

HENRY BALFOUR AND CO.,
ENGINEERS & IRONFOUNDERS.
DURIE FOUNDRY,
LEVEN, FIFE;
& 16, ADAM STREET, ADELPHI, LONDON, W.C.

Gas Engineers and Contractors for Gas and Water-Works; manufacturers of Steam Engines and Exhausters, Steam Boilers, Gasholders, Cast-Iron Tanks, Purifiers, Condensers, Iron Retorts, Gas and Water Pipes.

Plans, Specifications, and Estimate furnished for new, or for extensions and alterations on existing, Works.

ALFRED PENNY, Gas and CONSULTING ENGINEER,
WENLOCK IRON WORKS,
21 & 22, WHARF ROAD, CITY ROAD, LONDON.

Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, T-pieces, &c. &c.

Plans, Specifications, and Estimates prepared.

INTERNATIONAL EXHIBITION,
1862. CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for
good quality of Fire-Bricks.

WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE,
MANUFACTURERS OF EVERY DESCRIPTION OF
FIRE-BRICKS, CLAY RETORTS
&c. &c.
RETORT MOUTHPIECES, BOLTS, NUTS, &c.

International Exhibition,
July 11, 1862.
Class X., No. 2259.

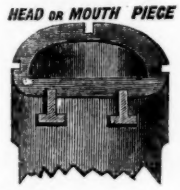
The Jurors have AWARDED A MEDAL to
JOSEPH CLIFF and SON,
Wortley, nr. Leeds,
For Excellence of Material and Manufacture of
FIRE-CLAY RETORTS FOR GAS.

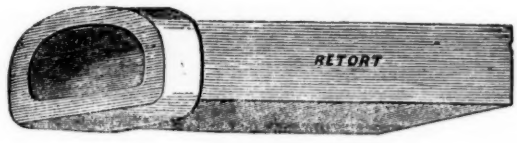
International Exhibition,
July 11, 1862.
Class XXXV., No. 6841.

JOSEPH CLIFF and SON,
Wortley, nr. Leeds,
Are Awarded Honourable Mention for
STONEWARE DRAIN-PIPES
OF LARGE DIAMETER.

KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.





KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Burs, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

R. LAIDLAW & SON,

GAS ENGINEERS, IRON & BRASS FOUNDERS,

Alliance Foundry, 147, East Milton Street, and Barrowfield Iron-Works,

GLASGOW;

AND AT SIMON SQUARE, EDINBURGH;

MANUFACTURERS OF

STATION & CONSUMERS METERS, ALL SIZES;

WROUGHT-IRON TUBES, FOR GAS, WATER, & STEAM; CAST-IRON RETORTS & PIPES;

HYDRAULIC MAINS, CONDENSERS, WASHERS, SCRUBBERS, PURIFIERS, & TANKS.

GASHOLDERS;

GOVERNORS, SLIDE-VALVES, &c.;

WROUGHT & CAST IRON ROOFS & HOUSES.

Contractors for Gas-Works of any Magnitude. *Plans, Specifications, and Estimates furnished.*

SOLE AGENT FOR THE SOUTH, SOUTH-EAST, AND SOUTH-WEST OF ENGLAND:—

J. E. DOWSON, 8, BANKSIDE, SOUTHWARK, LONDON, S.E.

TRUSS'S PATENT ELASTIC PIPE-JOINT,

FOR GAS AND WATER-MAINS, AND STEAM PIPING,

Is the only PERFECT joint that has ever been constructed, and supplies the long-felt desideratum, by allowing for the expansion and contraction of metals, and for oscillation and deflection, without impairing the joint. Gas Companies will effect an incalculable saving in adopting it, as compared with the present imperfect mode of jointing.

Drawings, Estimates, and every particular, furnished on application to

THOMAS SEAVILLE TRUSS, C.E., 53, GRACECHURCH STREET, LONDON, E.C.

LLOYD AND LLOYD

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES & FITTINGS,

PLAIN, GALVANIZED, & ENAMELLED, for Gas, Steam, and Water, from $\frac{1}{8}$ in. to 6 in. bore.

STOCKS TAPS, and DIES, GUN METAL GLAND-COCKS, WATER-GAUGES, &c.;

PATENT LAP-WELDED IRON TUBES,

For Locomotive and Marine Boilers, &c.

LONDON WAREHOUSE—No 66, QUEEN STREET, E.C.

FIRE-CLAY GAS RETORTS.

ESTABLISHED IN 1795.

JOSEPH CLIFF and SON,

WORTLEY FIRE-BRICK WORKS, near LEEDS,

Are Awarded the PRIZE MEDAL for Excellence of Material and Manufacture of Clay Retorts, July 11, 1862.

Class X., No. 2259.

THESE RETORTS are unrivalled in excellence, being the BEST FINISHED INTERNALLY, and THE MOST CORRECT IN FORM, of any in the Kingdom. From the peculiar composition used in working up the face of the material, they are rendered unusually smooth, close, and FREE FROM SURFACE CRACKS, thus, in a great measure, preventing leakage and the adhesion of carbon to their interior surface.

To meet the yearly increasing demand of UPWARDS OF THIRTY SEASONS and to carry out the late improvements in the manufacture, the Premises have been re-erected and much enlarged, and Engineers may rely WITH CONFIDENCE on their orders being completed with a greater regard to despatch than by any other House.

THE WORKS ARE WELL SITUATED

For EXPORT from the Ports of LONDON, LIVERPOOL, HULL, MIDDLESBRO', HARTLEPOOL, and STOCKTON.

FIRE-BRICKS, LUMPS, GUARDS, TILES, AND CLAY OF THE SAME QUALITY.

M. B. NEWTON, London Agent, No. 4, Wharf, King's Cross Goods Station.

WILLIAM INGHAM AND SONS,

WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.'s Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

WILLIAM RICHARDS,

SOLE INVENTOR AND FIRST MANUFACTURER

OF THE

DRY GAS-METER,

Which obtained Prizes at the Exhibitions of London, 1851; New York, 1853; Paris, 1855; and three Prizes at the present Exhibition of 1862.

CRAWFORD PASSAGE, COPPICE ROW, CLERKENWELL, LONDON.

W. RICHARDS invites the attention of Gas Companies and Engineers to the Dry Meter manufactured by him, as possessing advantages over others, by his method of disposing of the flexible material, so that collapsing or bagging of the same is avoided. This defect, so conspicuous in some of the meters of other makers shown at the Exhibition, causes the measurement of the instrument to vary under different circumstances, and the durability of the same is materially impaired.

In the meters manufactured by W. Richards, all the metals of the working parts are incorrodible; the flexible material, the best that can be employed; and, in general construction, they are not to be surpassed.

To those who prefer the Wet Meter, W. Richards submits his patented improvements in the same, which consist in contracting the measuring-wheel at, and near, the water-line—thus allowing of a longer range for the float, and avoiding the sudden extinctions now so common; also, a simple remedy is applied to prevent fraudulent consumption, which the operation of the Sales of Gas Act has so much facilitated.

TELL-TALE EXHAUST AND PRESSURE-INDICATORS;

GOVERNORS, STATION-METERS, &c.

WILLIAM SUGG,

MANUFACTURER OF

PATENT DRY AND WATER GAS-METERS, TEST GASHOLDERS, AND APPARATUS,

"EVANS'S" PHOTOMETERS,

Experimental Meters, Minute Clocks, &c., Station-Meters and Governors,

STREET-LAMP GOVERNORS AND LAVA BURNERS,

19 and 20, MARSHAM STREET, WESTMINSTER.

INTERNATIONAL EXHIBITION, 1862.

TWO PRIZE MEDALS.

Class 13, No. 2973.

PHOTOMETERS, &c.,

Jury Award: PRIZE MEDAL,

For "Photometric Apparatus—for a well-constructed Apparatus to determine the Illuminating Power of Coal-Gas."

(PHILOSOPHICAL INSTRUMENTS, *North Gallery.*)

Class 31, Section B, No. 6350.

METERS, GOVERNORS, &c.,

Jury Award: PRIZE MEDAL,

For "General Excellence of Workmanship, and for his Improvements in Gas-Burners and Photometrical Apparatus."

(*Opposite* AMERICAN DEPARTMENT.)

LIVESEY FIRE-CLAY WORKS,

NEAR BLACKBURN, LANCASHIRE.

ORLANDO BROTHERS,

MANUFACTURER OF PATENT CLAY RETORTS,

AND EVERY DESCRIPTION OF

TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.

FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS.

INTERNATIONAL EXHIBITION, 1862.

Class X. No. 2265.

THE JURORS HAVE AWARDED TO

JOSEPH COWEN & CO.,

BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,

THE PRIZE MEDAL FOR "GAS RETORTS, FIRE-BRICKS, &c., FOR

EXCELLENCE OF QUALITY."

JOSEPH COWEN & CO. were the only parties to whom a Prize Medal was awarded in the Great Exhibition of 1851 for

"GAS RETORTS AND OTHER OBJECTS IN FIRE-CLAY."

SERVIER'S

PATENT

SELF-ACTING GAS GOVERNOR.

This Instrument, which is designed to replace the ordinary Governor,

Operates solely by the Action of the Gas, without any Alteration of Weights, or the Assistance of any intermediate Agency or Apparatus whatever;

And it will maintain a Constantly Uniform Pressure in Gas-Distributing Mains, at any given point of their circuit.

All Applications for Licences to Manufacture or to Use the Apparatus to be made to

Mr. W. H. BENNETT, 42, Parliament Street, Westminster.

WILLIAM & BENJAMIN COWAN,

PATENT WET & DRY GAS-METER MANUFACTURERS,

Buccleuch Street Works, Edinburgh, & 13, Strutt Street, Manchester.

Established 1827.

SOLE MANUFACTURERS OF

ESSON'S PATENT COMPENSATING GAS-METERS;

KAY'S PATENT HYDRAULIC VALVE GAS-METERS;

Also, DRY METERS OF THE MOST APPROVED DESCRIPTION;

All of the above being Stamped under the Provisions of the SALE OF GAS ACT.

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